

AP MICROECONOMICS

UNIT 6

Market Failure and the Role of Government

**8–13%**

AP EXAM WEIGHTING

**~9–11**CLASS PERIODS



Remember to go to [AP Classroom](#) to assign students the online **Personal Progress Check** for this unit.

Whether assigned as homework or completed in class, the **Personal Progress Check** provides each student with immediate feedback related to this unit's topics and skills.

Personal Progress Check 6

Multiple-choice: ~15 questions

Free-response: 2 questions

- Short
- Long

Market Failure and the Role of Government



Developing Understanding

BIG IDEA 4

Market Inefficiency and Public Policy **POL**

- How do markets fail?
- What role should the government play in markets?

This unit prepares students to understand the theoretical arguments for and against government intervention in markets and therefore has important public policy applications. Students will examine the conditions under which markets may fail and the effectiveness of government policies that are designed to correct market failures. In exploring the idea of market failures and government interventions to correct them, students will build on their understanding of efficiency and what it means for a firm to produce the socially optimal quantity or not. Students will also learn about how inequality is measured and the sources of income and wealth inequality.

Building Course Skills

1.A 1.B 2.A 4.B 4.C

Students will have had multiple opportunities to practice the course skills by this point in the course. This unit provides various opportunities to engage students in identifying economic concepts and principles, interpreting given outcomes, and predicting and explaining the effects of economic situations using real-world examples that are relevant to their lives and role as citizens in a democratic republic.

Continue to appropriately model and provide opportunities for students to practice graphing economic situations and the effects of changes in economic situations. This is particularly important in the context of graphing externalities and the effects of government intervention, which are frequent challenge areas for students on the AP Exam.

Preparing for the AP Exam

As in Unit 5, the topics addressed in this unit (namely, externalities and the effects of government intervention in different market structures) appear in some of the most frequently missed questions on the AP Exam. Again, there may be an inclination to rush through this unit since overall it accounts for only a small percentage of the multiple-choice questions on the AP Exam and is at the very end of the course when there may be limited time left before the exam. However, it is important to prepare students to answer questions about positive and negative externalities, deadweight loss, and government interventions.

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skills	Class Periods
			~9–11 CLASS PERIODS
POL-2	6.1 Socially Efficient and Inefficient Market Outcomes	2.A Using economic concepts, principles, or models, explain how a specific economic outcome occurs or what action should be taken in order to achieve a specific economic outcome.	1
	6.2 Externalities	4.B Demonstrate your understanding of a specific economic situation on an accurately labeled graph or visual.	2
POL-3	6.3 Public and Private Goods	1.B Identify an economic concept, principle, or model illustrated by an example.	1
POL-4	6.4 The Effects of Government Intervention in Different Market Structures	4.C Demonstrate the effect of a change in an economic situation on an accurately labeled graph or visual.	2
POL-5	6.5 Inequality	1.A Describe economic concepts, principles, or models.	1
 Go to AP Classroom to assign the Personal Progress Check for Unit 6. Review the results in class to identify and address any student misunderstandings.			

SAMPLE INSTRUCTIONAL ACTIVITIES

The sample activities on this page are optional and are offered to provide possible ways to incorporate various instructional approaches into the classroom. Teachers do not need to use these activities or instructional approaches and are free to alter or edit them. The examples below were developed in partnership with teachers from the AP community to share ways that they approach teaching some of the topics in this unit. Please refer to the Instructional Approaches section beginning on p. 105 for more examples of activities and strategies.

Activity	Topic	Sample Activity
1	6.2	Response Groups Working in small groups, provide students with examples of situations that describe either a negative or positive externality. Give each group a different situation. Each group should identify the externality, graph the market failure indicating the deadweight loss, and then offer solutions to correct the situation. A presenter from each group will demonstrate the findings for the class.
2	6.3	Socratic Seminar Tell students a true or fictional story of a public good problem. For example, explain that you live on a lake that is no longer safe for swimming because of an algae bloom. Provide pictures and compelling details. Engage students in a classroom discussion to determine how and why a private market could or could not solve this problem. Challenge students to propose a cost-effective solution.
3	6.4	Practice Modeling First, demonstrate to students how to graphically model the effect of a government policy action in the context of a specific market structure. Then change the scenario by considering a different action or market structure. Provide an opportunity for students to practice generating the graph with appropriate labels. Allow students to provide feedback to one another and circle the room to clarify questions and misunderstandings.



Unit Planning Notes

Use the space below to plan your approach to the unit. Consider how you want to pace your course and methods of instruction and assessment.

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1. Estate Tax

A tax assessed on the total value of a person's private property after he/she dies; often assessed only on large estates.

2. Externality

Either a positive or negative side-effect of production and/or consumption. Costs incurred by those who do not produce the product and benefits that accrue to those who are not the purchasers are both examples of externalities.

3. Gift Tax

A tax placed on gifts received from another person.

4. Gini Coefficient

The ratio of the area above the Lorenz curve to the total area below the line of equality. Gini coefficients range between zero and one. Societies with higher Gini coefficients have more unequally distributed wealth or income.

5. Lorenz Curve

A graph that shows the relative equality of the income or wealth distribution in a society.

6. Marginal Private Benefit

The private benefit of consuming an additional unit of a good or service; benefit obtained by the consumer only.

7. Marginal Private Cost

The private cost of producing an additional unit of output; costs incurred by the producer/seller only.

8. Marginal Social Benefit

The benefit to society of consuming an additional unit of a good or service. This includes marginal private benefit and the external benefits that are captured by non-buyers.

9. Marginal Social Cost

The cost to society of producing an additional unit of output. This includes marginal private costs and those external costs that are incurred by third parties.

10. Market Failure

The failure of a market to provide a good/service or to allocate goods/services in a socially optimal manner. Market failure may result from inadequate competition, from externalities, from informational advantages on the part of the buyer or seller, or from other causes.

11. Negative Externality

A side-effect of production or consumption which places a cost on someone other than the consumer or producer of the good or service. These unpaid costs to society lead goods of this type to be overproduced in unregulated markets.

12. Non-Excludable

The condition in which the benefit of a good or service cannot be withheld if a consumer does not pay for it. Nonexcludability often leads to the free rider problem in which people who would otherwise buy a good choose not to and end up receiving most or all of the benefit anyway.

13. Non-Rival

The condition in which one person's consumption of a good or service does not prevent another person from consuming the exact same good or service. Also known as shared consumption.

14. Positive Externality

A side effect of production or consumption which provides a benefit to someone other than the consumer or the producer of the good or service. Positive externalities tend to result in underproduction of the good or service in question.

15. Progressive Tax

A tax which takes a greater percentage of income from households with high income than households with low income. The United States income tax is set up in a progressive manner because higher-income earners are in higher tax brackets.

16. Proportional Tax

A tax which takes the same percentage of income from all households.

17. Public Good

A good or service that is provided by the government. Goods tend to work best as public goods if they are nonrival and non-excludable. Public goods are financed by tax revenue.

18. Regressive Tax

A tax which takes a greater percentage of income from households with low income than households with high income.

19. Rival

The condition in which one person's consumption of a good or service prevents another person from consuming the exact same unit of the good or service.

20. Socially Optimal

The market condition that is met when the marginal social benefit equals the marginal social cost. Also known as the allocatively efficient level of output.

21. Subsidy

A payment from the government that is made to either a consumer or producer of a good/service. Subsidies function like a negative tax: they encourage production and/or consumption of a good by reducing their production cost.

SUGGESTED SKILL

 Interpretation

2.A

Using economic concepts, principles, or models, explain how a specific economic outcome occurs, or what action should be taken in order to achieve a specific economic outcome.

TOPIC 6.1

Socially Efficient and Inefficient Market Outcomes

Required Course Content

ENDURING UNDERSTANDING

POL-2

Perfectly competitive markets allocate resources efficiently, but imperfect competition often results in market inefficiencies.

LEARNING OBJECTIVE

POL-2.A

- Define social efficiency.
- Explain (using graphs where appropriate) why resource allocation in perfectly competitive markets is socially efficient.

POL-2.B

Explain (using graphs where appropriate) how private incentives can lead to actions by rational agents that are socially undesirable (inefficient) market outcomes.

ESSENTIAL KNOWLEDGE

POL-2.A.1

The optimal quantity of a good occurs where the marginal benefit of consuming the last unit equals the marginal cost of producing that last unit, thus maximizing total economic surplus.

POL-2.A.2

The market equilibrium quantity is equal to the socially optimal quantity only when all social benefits and costs are internalized by individuals in the market. Total economic surplus is maximized at that quantity. [See also PRD-3 and POL-3.]

POL-2.B.1

Rational agents can pursue private actions to exploit or exercise market characteristics known as market power.

POL-2.B.2

Rational agents make optimal decisions by equating private marginal benefits and private marginal costs that can result in market inefficiencies.

continued on next page

LEARNING OBJECTIVE

POL-2.B

Explain (using graphs where appropriate) how private incentives can lead to actions by rational agents that are socially undesirable (inefficient) market outcomes.

POL-2.C

- Explain equilibrium allocations in imperfect markets relative to efficient allocations (using graphs where appropriate) and why these markets are inefficient.
- Calculate (using graphs where appropriate) the deadweight loss resulting from the production of a non-efficient quantity.

ESSENTIAL KNOWLEDGE

POL-2.B.3

Policymakers use cost-benefit analysis to evaluate different actions to reduce or eliminate market inefficiencies.

POL-2.B.4

Market inefficiencies can be eliminated by designing policies that equate marginal social benefit with marginal social cost.

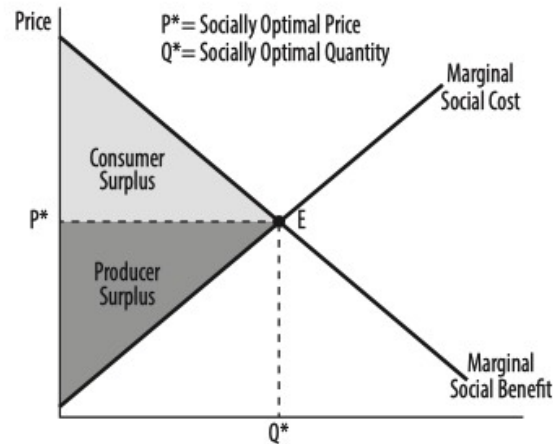
POL-2.C.1

Equilibrium allocations can deviate from efficient allocations due to situations such as monopoly; oligopoly; monopolistic competition; negative and positive externalities in production or consumption; asymmetric information; and insufficient production of public goods.

POL-2.C.2

Producing any non-efficient quantity results in deadweight loss.

- A. Social efficiency is achieved when the marginal social benefit (MSB) of consuming a good or service is equal to the marginal social cost (MSC) of producing the good or service. This means that all of the costs of production and all of the benefits of consumption are internalized in the equilibrium price and quantity. $MSB = MSC$ means that the optimal level of output is achieved where the cost to society of producing the last unit is equal to the benefit society derives from its consumption. Any more output would result in the cost exceeding the benefit. Any less output would result in a potential welfare gain for society.
1. Social efficiency maximizes economic welfare as seen below. The sum of producer and consumer surplus equals total economic surplus.



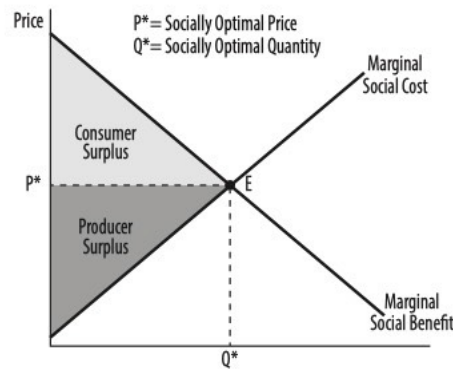
2. P^* represents the socially optimal price and Q^* represents the socially optimal quantity.
3. In perfectly competitive markets, the supply curve equals the marginal social cost curve and the demand curve equals the marginal social benefit curve, only if all social benefits and costs are internalized by individuals in the market.
- B. Imperfectly competitive markets, such as monopoly, oligopoly, and monopolistic competition result in equilibrium price and quantity outcomes that are less than socially optimal or efficient.
- C. Market failures happen when a market does not allocate or distribute goods or services efficiently, or when markets fail to provide certain goods or services.

1. Define the following:
 - Asymmetrical Information
 - Marginal private benefit
 - Marginal private cost
 - Marginal social benefit
 - Marginal social cost
 - Market Failure
 - Social efficiency
 - Socially optimal quantity
2. Draw a graph of a market which is producing a socially optimal quantity. Identify areas of consumer surplus and producer surplus.
3. How would you calculate the actual value of consumer surplus, producer surplus, and total surplus in a market?
4. When do perfectly competitive markets produce a socially optimal quantity.
5. Explain why imperfectly competitive markets do not typically produce a socially optimal quantity.

1. Define the following:

Asymmetrical Information	<i>producers often possess more information about the good or service they sell than do consumers</i>
Marginal private benefit	<i>The additional benefit to consumers of consuming a good or service</i>
Marginal private cost	<i>The additional cost of producing a good or service paid for by the producer</i>
Marginal social benefit	<i>The additional benefit to society when consumers consume a good or service</i>
Marginal social cost	<i>The additional cost to society when producers produce a good or service</i>
Market Failure	<i>When markets misallocate a good or service, or do not properly assign costs and/or benefits</i>
Social efficiency	<i>Maximum economic surplus ... zero deadweight loss</i>
Socially optimal quantity	<i>Quantity associated with marginal social benefit = marginal social cost</i>

2. Draw a graph of a market which is producing a socially optimal quantity. Identify areas of consumer surplus and producer surplus.



3. How would you calculate the actual value of consumer surplus, producer surplus, and total surplus in a market?

Find the areas of each triangle by using the formula (base X height) / 2

4. When do perfectly competitive markets produce a socially optimal quantity.

When $MPB = MSB$ and $MPC = MSC$

5. Explain why imperfectly competitive markets do not typically produce a socially optimal quantity.

They produce a quantity associated with $(MR < P) = MC$, so $P > MC$, and $Q_{\text{imperfect}} < Q_{\text{perfect}}$

SUGGESTED SKILL

 *Graphing and Visuals*

4.B

Demonstrate your understanding of a specific economic situation on an accurately labeled graph or visual.



AVAILABLE RESOURCE

- Classroom Resources > **Mastering Economic Thinking Skills—Marginal Thinking: Key Concepts and Questions**

TOPIC 6.2

Externalities

Required Course Content

ENDURING UNDERSTANDING

POL-3

Private incentives can fail to account for all socially relevant considerations.

LEARNING OBJECTIVE

POL-3.A

- Define externalities.
- Explain (using graphs where appropriate) how in the presence of externalities, private markets do not take into consideration social costs or social benefits.

POL-3.B

Explain (using graphs where appropriate) how public policies address positive or negative externalities.

ESSENTIAL KNOWLEDGE

POL-3.A.1

The socially optimal quantity of a good occurs where the marginal social benefit of consuming the last unit equals the marginal social cost of producing that last unit, thus maximizing total economic surplus.

POL-3.A.2

Externalities are either positive or negative and arise from lack of well-defined property rights and/or high transaction costs.

POL-3.A.3

In the presence of externalities, rational agents respond to private costs and benefits and not to external costs and benefits.

POL-3.A.4

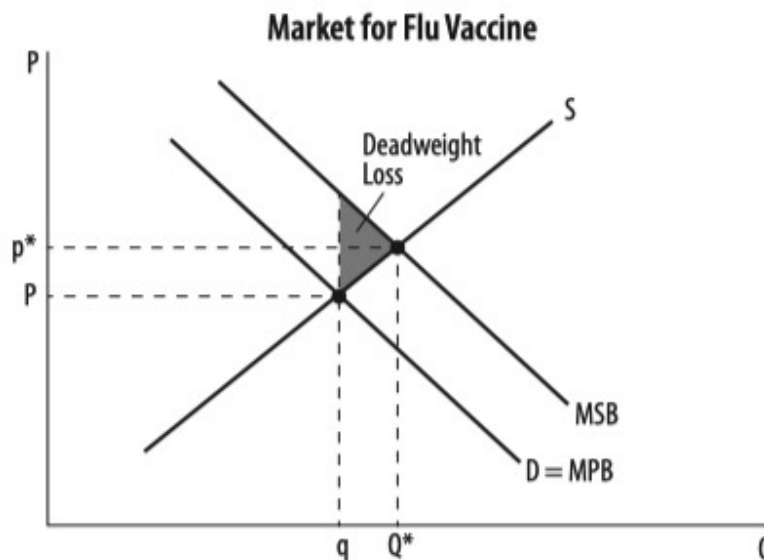
Rational agents have the incentive to free ride when a good is non-excludable.

POL-3.B.1

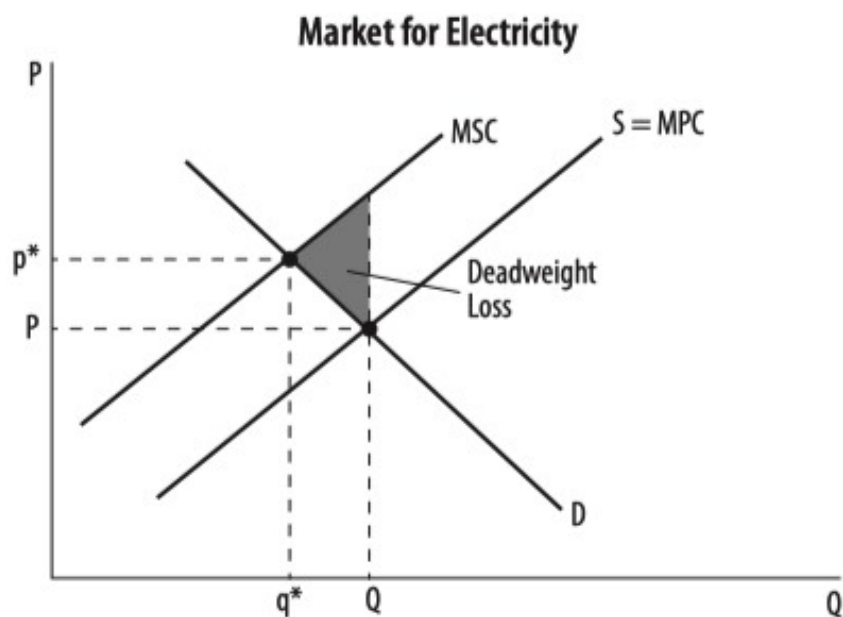
Policies that address positive or negative externalities include taxes/subsidies, environmental regulation, public provision, the assignment of property rights, and the reassignment of property rights through private transactions.

A. Externalities are unintended side effects of the production and consumption of a good or service.

1. Sometimes a good or service creates a benefit for some that are neither the producer nor the consumer of the good or service. When this happens, economists call it a positive externality.
 - i. An example of a good that provides a positive externality is the flu vaccine.
 - ii. When doctors and nurses (producers) “give” (sell) flu shots to their patients (consumers), both the producers and the consumers benefit. Other people who have not consumed the flu vaccine still receive benefits because as more people pay and get flu shots, the risk of the flu goes down not only for the consumers, but also for those who did not pay and get the shot.
 - iii. If a good or service creates a positive externality, then its marginal benefit to society, or marginal social benefit (MSB) is greater than its marginal benefit to just the consumers, or marginal private benefit (MPB). Marginal private benefit is the market demand and in this case understates the true benefit the product provides.
 - iv. The following graph shows the market for flu vaccine that creates a positive externality. The presence of a positive externality creates deadweight loss because the private market for the vaccine does not produce the allocatively efficient quantity at the market equilibrium, $MSB > MC$, indicating an underproduction of the good. Notice the difference between the market equilibrium price (p) and quantity (q) and the socially optimal price (p^*) and quantity (q^*). The socially optimal price (p^*) and quantity (q^*) are allocatively efficient because the $MSB = MC$.

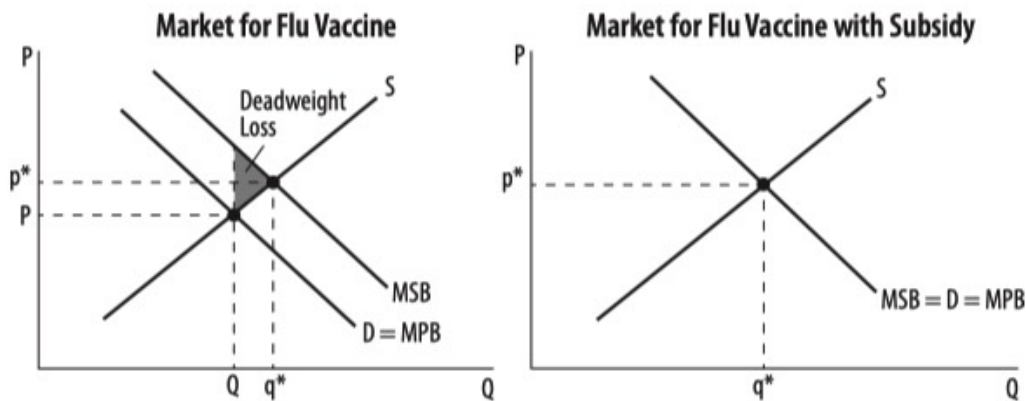


2. Many forms of production create some negative externality. A negative externality happens when somebody other than the producer or consumer is forced to bear some of the costs of production.
- An example of negative externality is air pollution. Many power plants burn coal in order to produce electricity and this creates air pollution. Others who neither produce nor consume the electricity are left with costs such as damages from acid rain, medical bills from asthma treatment, and so on.
 - If a good or service creates a negative externality, then its marginal cost to society, or marginal social cost (MSC) is greater than its marginal cost to just the producer, or marginal private cost (MPC). Marginal private cost is the market supply and in these situations understates the true cost of making the product in question.
 - The following graph shows the market for electricity which creates a negative externality, pollution. The presence of a negative externality creates deadweight loss because the private market for electricity does not produce the allocatively efficient quantity at the market equilibrium $MSC > MB$, indicating overproduction. Notice the difference between the market equilibrium price (p) and quantity (q) and the socially optimal price (p^*) and quantity (q^*). The socially optimal price (p^*) and quantity (q^*) are allocatively efficient because the $MSC = MB$.

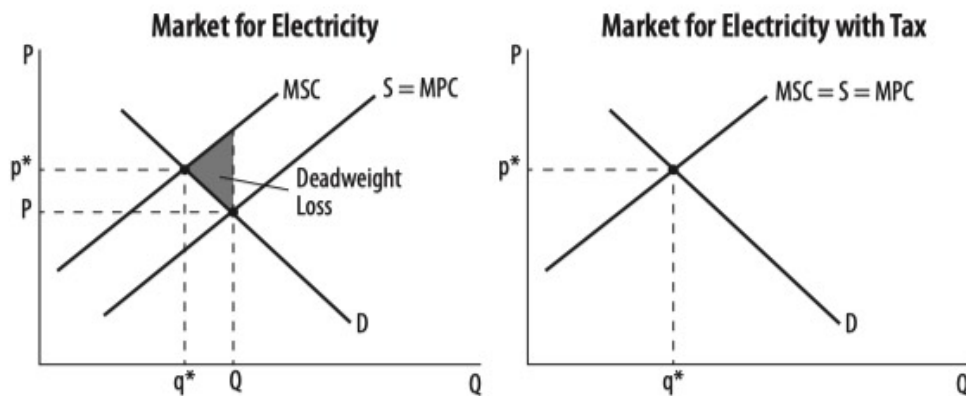


3. Remedies for externalities often come from the government.

- i. In the case of a positive externality, the government can provide a per-unit subsidy to either the producer or consumer in order to achieve the socially optimal quantity of output.
- ii. The following graphs show how a per-unit subsidy paid to the consumer of flu vaccine would affect the market. Notice that the subsidy increases the demand for the vaccine so that the $MPB = MSB$ and allocative efficiency in the market is achieved.



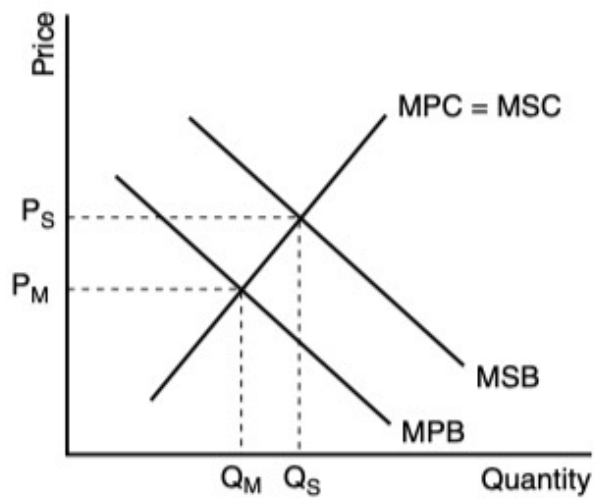
- iii. In the case of negative externalities, government can assess a per-unit tax on producers in order to bring about the socially optimal price and quantity.
- iv. The following graphs show how a per-unit tax on the producer of electricity would affect the market. Notice that the tax raises the marginal private cost at every level of output (acting as a decrease in supply) of producing electricity so that the $MPC = MSC$ and allocative efficiency in the market is again achieved.



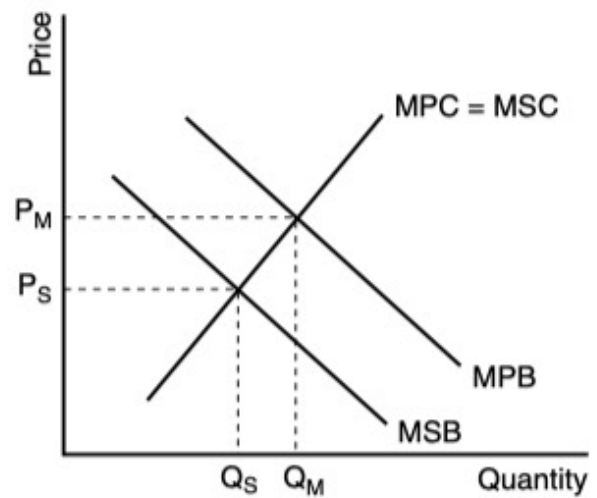
4. Remedies for externalities can also come about through private bargaining. The Coase Theorem says that an allocatively efficient outcome can be reached without government involvement. If the cost of bargaining is zero and private-property rights are clearly defined, then (in the case of a negative externality) the producer and the party victim can negotiate a payment to address the externality. Either the victim can pay the producer to not produce, or the producer can pay the victim so as to offset the cost of the externality.

Externalities can be modeled 4 different ways based on whether the externality is positive or negative and whether or not it is caused by production or consumption.

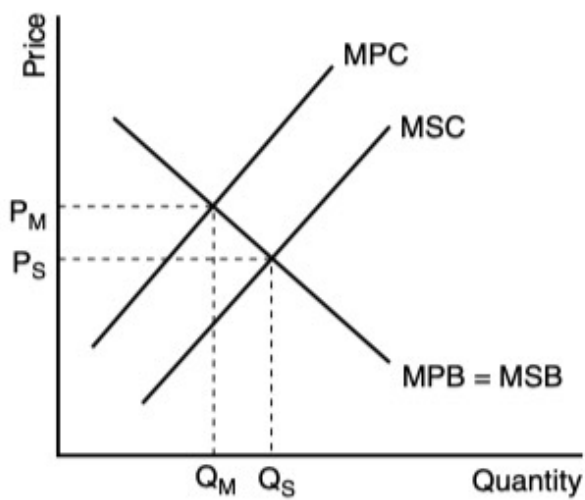
Example—Positive Consumption Externality



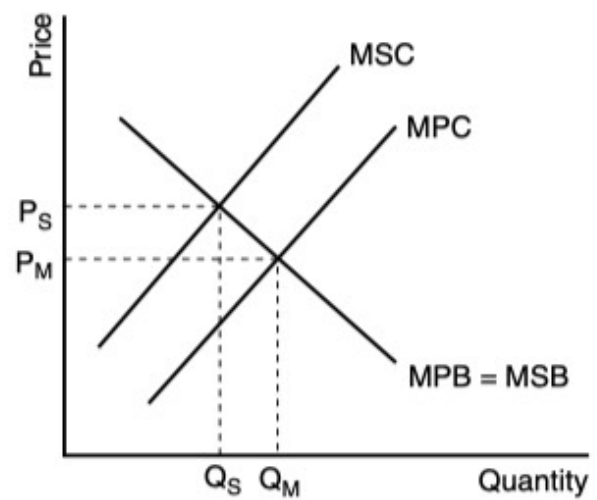
Example—Negative Consumption Externality



Example—Positive Production Externality



Example—Negative Production Externality



1. Define the following:
 - externality
 - lump sum subsidy
 - lump sum tax
 - negative externality
 - per unit subsidy
 - per unit tax
 - positive externality
 - property rights
 2. Draw a market graph for a good which produces a negative consumption externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.
 3. Draw a market graph for a good which produces a positive consumption externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.
- .

4. Draw a market graph for a good which produces a negative production externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.

5. Draw a market graph for a good which produces a positive production externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.

1. Define the following:

externality

Unintended benefit or cost associated with production and/or consumption

lump sum subsidy

A fixed transfer payment from the government to a producer or consumer

lump sum tax

A fixed transfer payment from a producer or consumer to the government

negative externality

Spill-over cost of production or consumption which falls on neither producer or consumer

per unit subsidy

A transfer payment from the government to a producer or consumer for each unit produced or consumed

per unit tax

A transfer from a producer or a consumer to the government for each unit produced or consumed

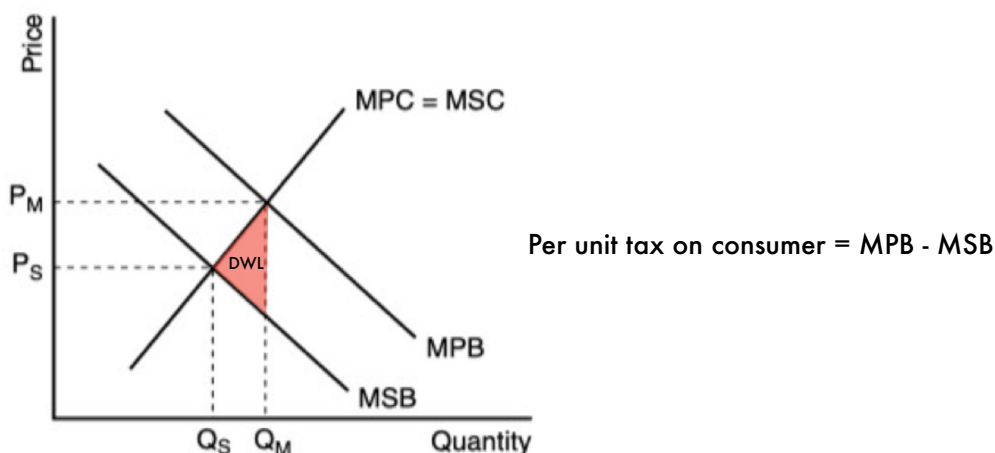
positive externality

Spill-over benefit of production or consumption which extends beyond either the producer or the consumer

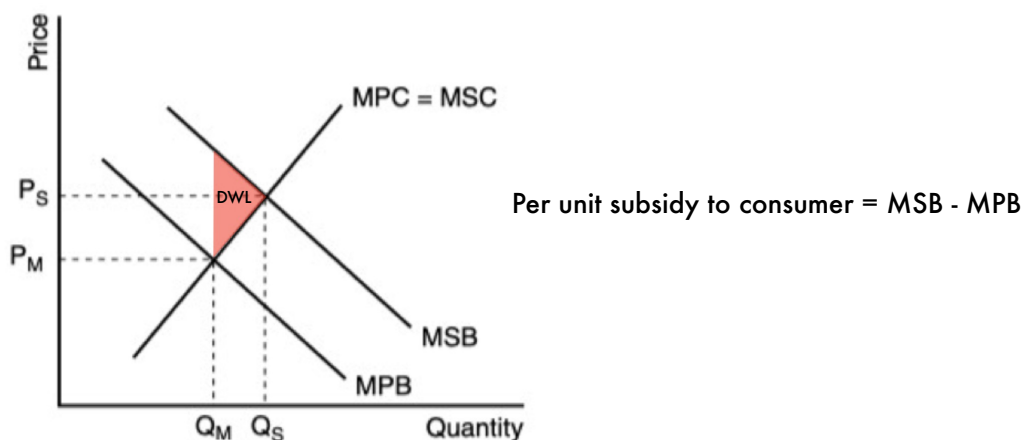
property rights

The ability to exercise control over a good or a resource

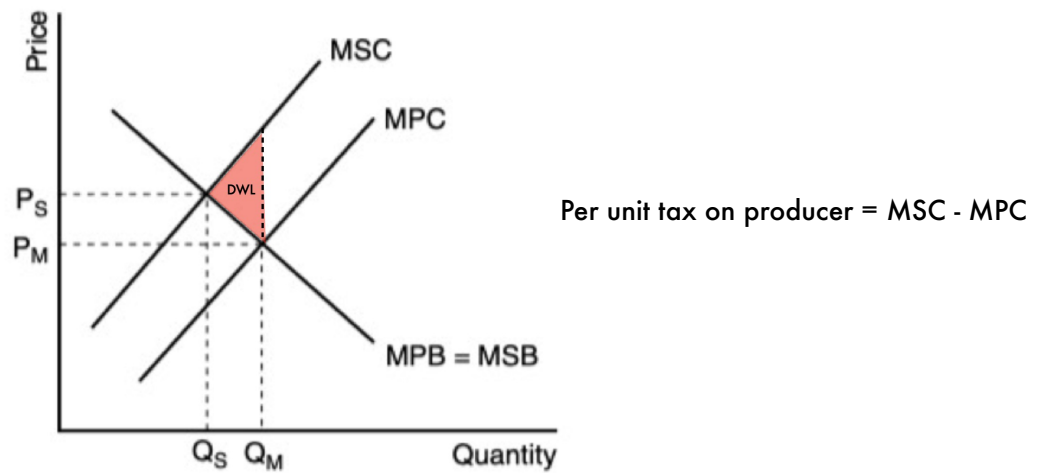
2. Draw a market graph for a good which produces a negative consumption externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.



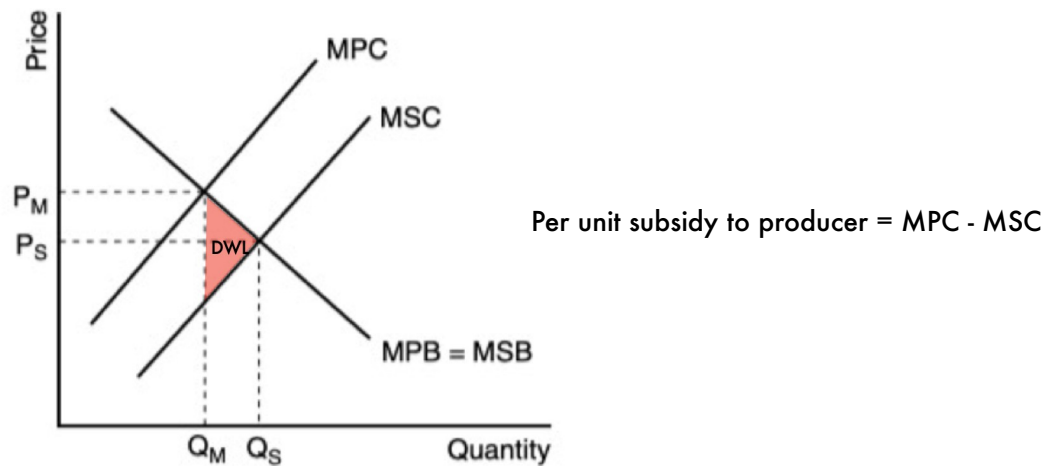
3. Draw a market graph for a good which produces a positive consumption externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.



4. Draw a market graph for a good which produces a negative production externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.



5. Draw a market graph for a good which produces a positive production externality. Identify the area of deadweight loss, and also indicate an appropriate government response to correct the externality.



15. Which of the following is true if the production of a good imposes external costs?
- (A) The market supply curve lies above the marginal social cost curve.
 - (B) An appropriate government policy would be to subsidize production of the good.
 - (C) A competitive market would not provide the good at all.
 - (D) A competitive market would produce more than the socially optimal amount.
 - (E) A persistent market surplus would occur.

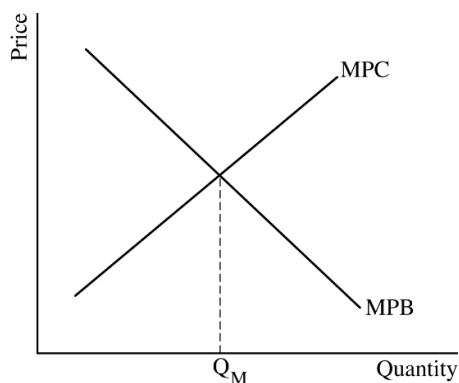
2. Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.
- (a) Draw a correctly labeled graph of the copper market with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.
- (i) The market equilibrium quantity, labeled Q_M
 - (ii) The socially efficient quantity, labeled Q_S
- (b) Suppose the demand for copper decreases. On your graph in part (a), show the deadweight loss at the new market equilibrium, shaded completely.
- (c) Suppose the government is considering levying a tax on copper.
- (i) What per-unit tax level would achieve the socially optimal quantity?
 - (ii) Explain why a lump-sum tax on producers will not achieve the socially optimal quantity in the short run.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

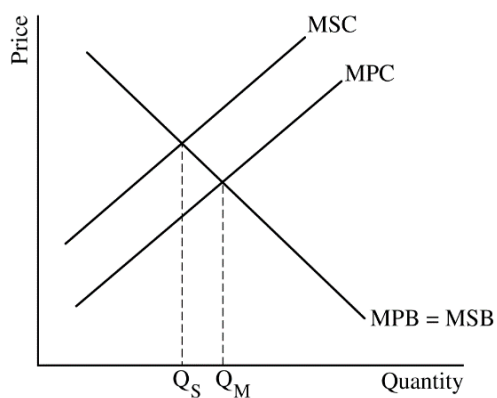
Question 2: Short

5 points

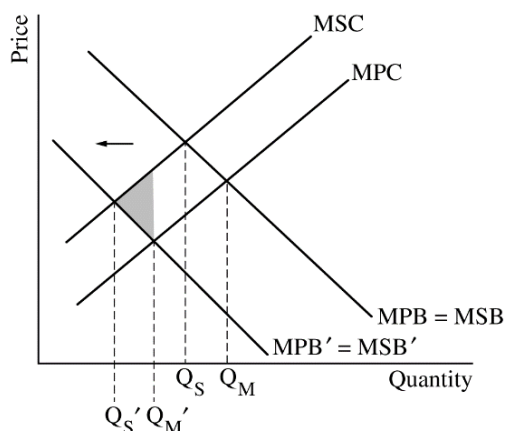
- (a) Draw a correctly labeled graph with an upward-sloping supply curve labeled MPC, a downward-sloping demand curve labeled MPB, and the market equilibrium quantity labeled Q_M . **1 point**



- For the second point, the graph must include the MSC curve above the MPC curve at all output levels and must show the socially efficient quantity labeled Q_S . **1 point**

**Total for part (a) 2 points**

- (b) On your graph from part (a), show a leftward shift of the demand curve and shade completely the area of deadweight loss at the new market equilibrium. **1 point**

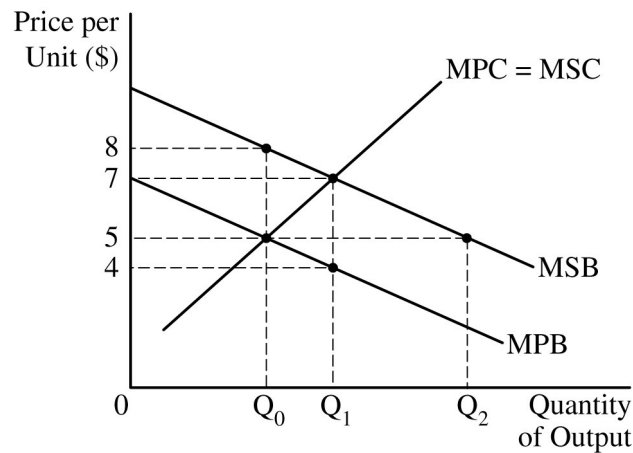


- (c) (i) State that the per-unit tax would be equal to the marginal external cost ($MSC - MPC$). **1 point**
- (ii) Explain that the lump-sum tax will not change the quantity produced because it does not affect the marginal cost. **1 point**

Total for part (c) 2 points

Total for question 2 5 points

2. Bueno is a firm that produces and sells guava, a type of fruit. The market for guava is perfectly competitive. The marginal private benefit (MPB), marginal private cost (MPC), marginal social benefit (MSB), and marginal social cost (MSC) curves are illustrated in the graph provided.



- (a) Identify the kind of market failure represented by this graph.
- (b) Using numbers from the graph, identify the marginal external benefit.
- (c) Assume the guava market is in short-run equilibrium and Bueno hires workers in a perfectly competitive labor market at a wage of \$20 per hour. The marginal product of the last worker hired was 6 units of guava per hour.
- Calculate the change in Bueno's profit per hour from the last worker hired. Show your work.
 - Suppose that the government decides to provide a per-unit subsidy to consumers who buy guava. How would the per-unit subsidy affect Bueno's marginal revenue product curve? Explain.
- (d) Instead of hiring workers in a perfectly competitive labor market, assume Bueno hires workers in a monopsony labor market. Will the number of workers hired increase, decrease, or stay the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Question 2: Short**5 points**

(a) State that there is a positive consumption externality. **1 point**

(b) State that the marginal external benefit is \$3. **1 point**

(c) (i) State that the change in profit per hour for Bueno is \$10 and show your work. **1 point**

Change in Profit per Hour

$$= \text{Marginal Revenue Product (MRP)} - \text{Marginal Factor Cost (MFC)}$$

$$= (\$5 \times 6) - \$20 = \$30 - \$20 = \$10$$

(ii) State that Bueno's MRP curve would shift up (or to the right) and explain that the subsidy would increase the demand for guava and increase the price paid by buyers, which would increase MRP for each worker and shift the curve to the right. **1 point**

Total for part (c) 2 points

(d) State that the number of workers hired will decrease as the quantity of labor hired will occur at a lower quantity of labor where $MFC = MRP$ and explain with **ONE** of the following: **1 point**

- The MFC for a monopsony is greater than the MFC for a perfectly competitive labor market.
- The MFC increases as the monopsony pays higher wages for every worker as it hires more workers whereas the MFC (or wage) is constant for a firm in a perfectly competitive labor market.

Total for question 2 5 points

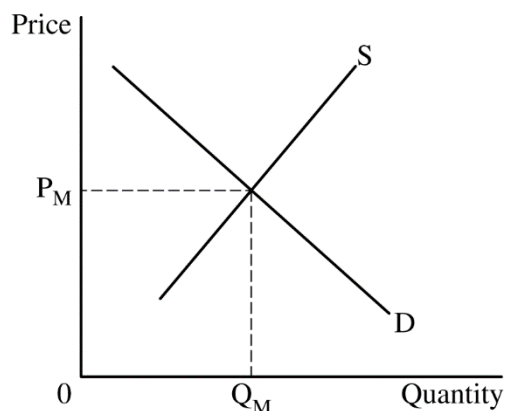
1. Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.
- (a) What must be true about the relationship between accounting profit and economic profit if Anderson Company currently incurs both explicit and implicit costs in production?
- (b) Draw correctly labeled side-by-side graphs for the market and Anderson Company and show each of the following.
- (i) The market equilibrium price and quantity, labeled P_M and Q_M , respectively
 - (ii) The profit-maximizing price and quantity for Anderson Company, labeled P_F and Q_F , respectively
 - (iii) The area representing Anderson Company's positive economic profit, shaded completely
- (c) On your graphs in part (b), show what will happen to each of the following if the market for Good G adjusts to long-run equilibrium.
- (i) The market equilibrium price and quantity, labeled P_2 and Q_2 , respectively
 - (ii) Anderson Company's profit-maximizing price and quantity, labeled P^* and Q^* , respectively
- (d) Assume the production of Good G creates benefits for third parties.
- (i) Given this situation, will the market equilibrium quantity be greater than, less than, or equal to the allocatively efficient quantity? Explain.
 - (ii) The government takes an action that corrects the externality in the market for Good G. As a result of the government's action, does total economic surplus increase, decrease, or stay the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

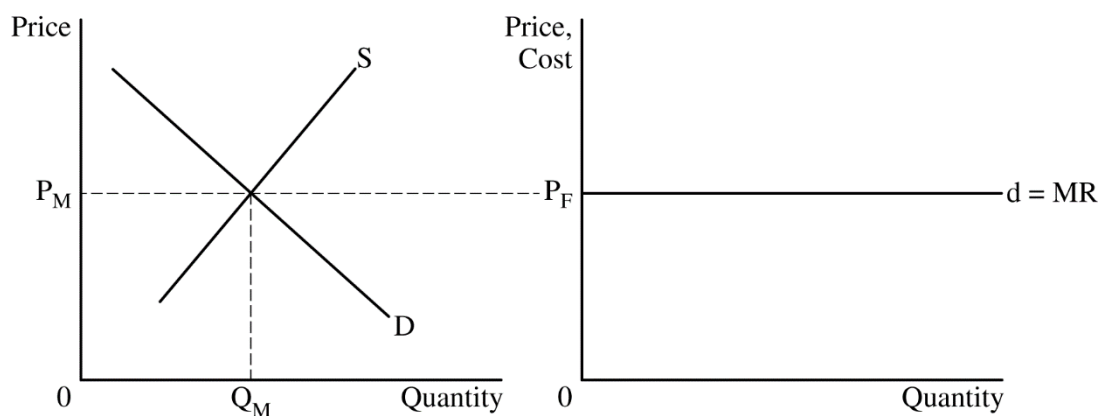
Question 1: Long

10 points

- (a) State that Anderson Company's accounting profit must be greater than its economic profit. **1 point**
- (b) Draw a correctly labeled graph of the market for Good G with a downward-sloping demand (D) curve and upward-sloping supply (S) curve and label the market equilibrium price as P_M and the market equilibrium quantity as Q_M . **1 point**

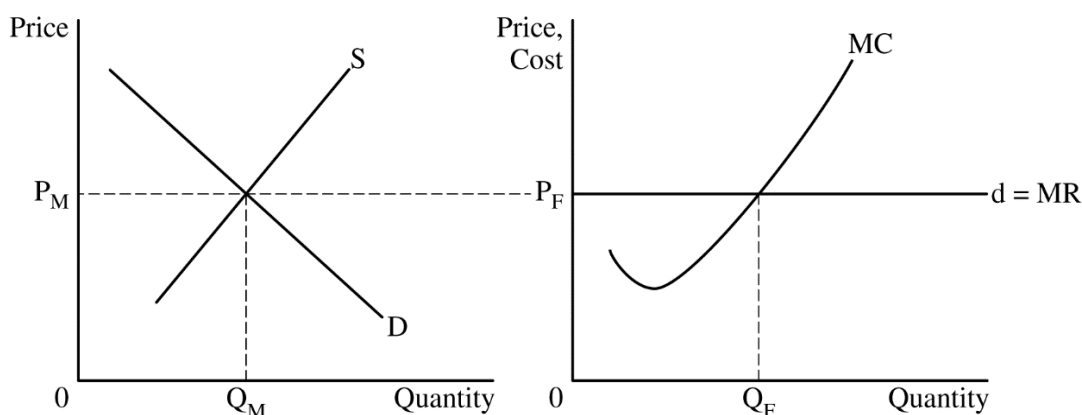


For the second point, draw a correctly labeled graph for the firm and show the firm's horizontal demand and marginal revenue ($d=MR$) curve extended from the market equilibrium price (P_M), and label the firm's price as P_F .

1 point

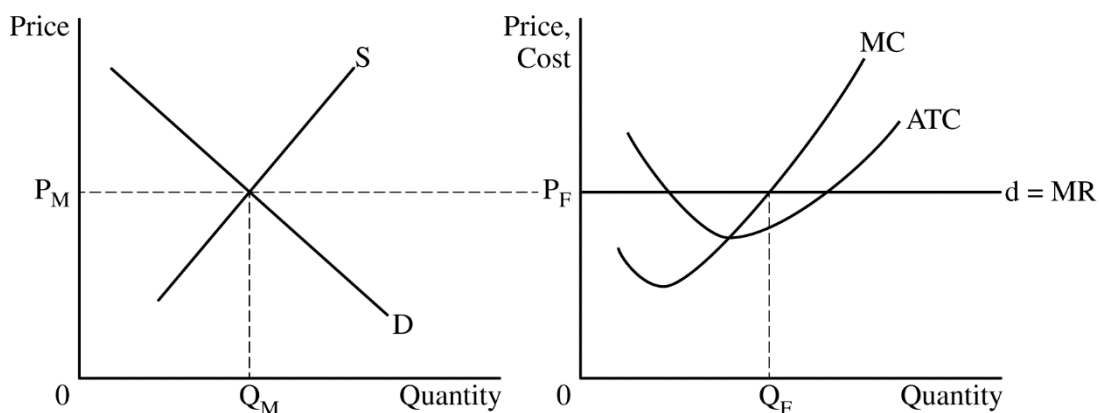
For the third point, the firm's graph must show a rising marginal cost (MC) curve and the profit-maximizing quantity, labeled Q_F where $MR = MC$.

1 point



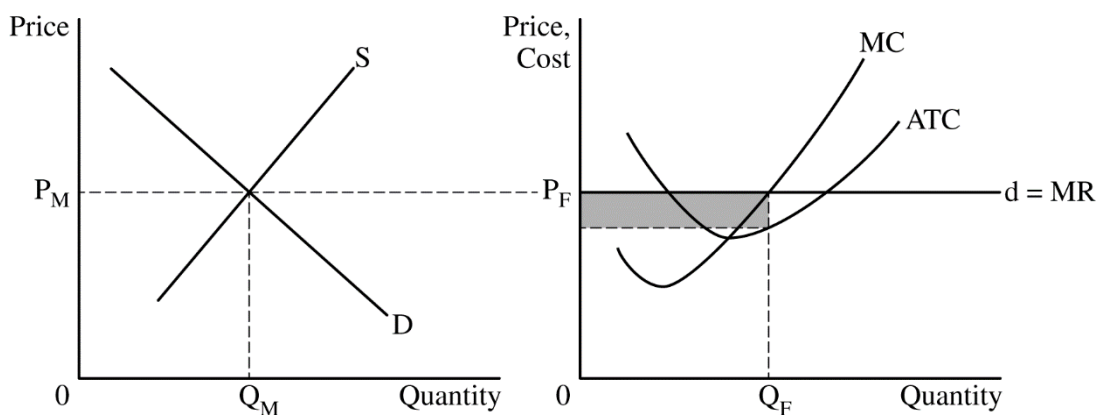
For the fourth point, the firm's graph must show the average total cost (ATC) curve below the firm's demand curve at Q_F and show the MC curve passing through the minimum point of the ATC curve.

1 point



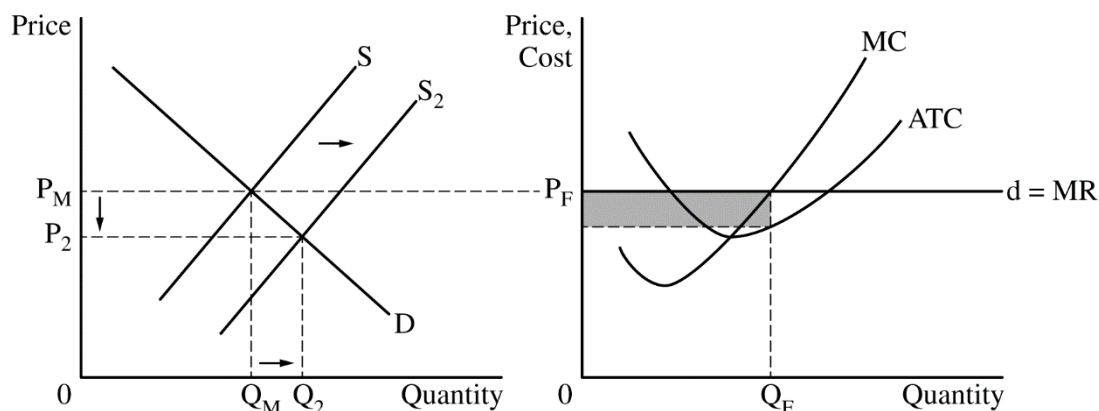
For the fifth point, the firm's graph must show the area representing positive economic profit, shaded completely.

1 point

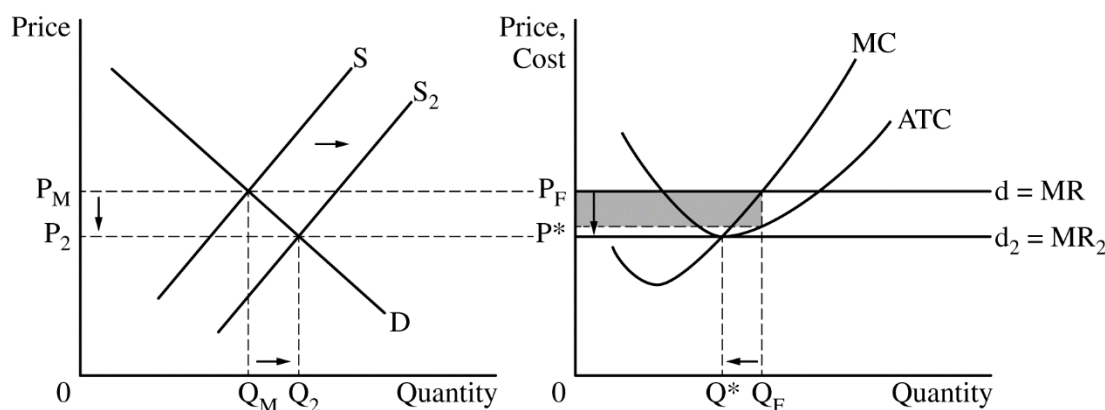


Total for part (b) 5 points

- (c)(i) On the market graph from part (a), show a rightward shift in the market supply curve, resulting in a lower market equilibrium price, labeled P_2 , and a greater market equilibrium quantity, labeled Q_2 . 1 point



- (ii) On the firm's graph from part (a), show a lower price, labeled P^* , extended from the new market equilibrium price, P_2 , and show a lower quantity produced, Q^* , at the new intersection point of $P^* = MR_2 = MC = \text{minimum ATC}$. 1 point



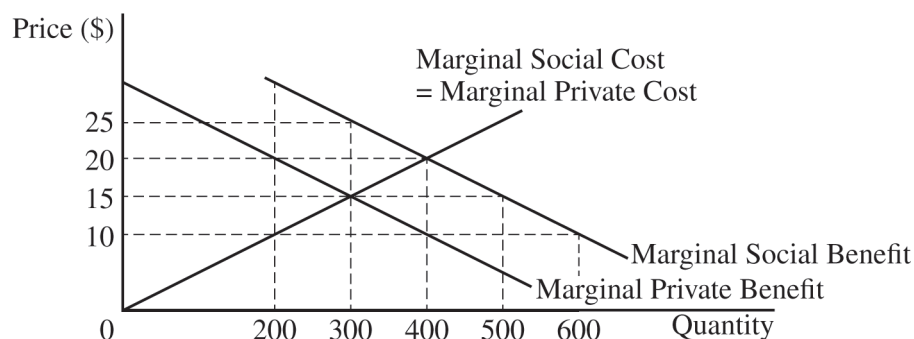
Total for part (c) 2 points

- (d)(i) State that the market equilibrium quantity will be less than the allocatively efficient quantity and explain that the positive externality in production causes the marginal social cost to be less than the marginal private cost ($MSC < MPC$) at the market equilibrium. 1 point
- (ii) State that total economic surplus will increase and explain with **ONE** of the following: 1 point
- The quantity produced will increase to the allocatively efficient quantity.
 - Deadweight loss will decrease to \$0.
 - The marginal private cost will equal the marginal social cost, causing the externality to be internalized.

Total for part (d) 2 points

Total for question 1 10 points

2. Good X is produced and sold in a perfectly competitive market. The provided graph shows the market for Good X.



- (a) Identify the market equilibrium price and quantity.
- (b) Calculate the deadweight loss at the market equilibrium. Show your work.
- (c) Suppose the government wants to eliminate the deadweight loss in the market for Good X.
- Which of the following will achieve the government's objective: a per-unit tax on consumers or a per-unit subsidy to consumers? Explain.
 - What is the dollar value of the per-unit tax or per-unit subsidy identified in part (c)(i) ?
- (d) Suppose instead the government imposes a price ceiling of \$10. Will the price ceiling achieve the socially optimal quantity of Good X? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Question 2: Short**5 points**

(a) State that the market equilibrium price is \$15, and the market equilibrium quantity is 300 units. **1 point**

(b) Calculate the deadweight loss as \$500 and show your work. **1 point**

$$\text{Deadweight loss} = \frac{1}{2} \times (\$25 - \$15) \times (400 - 300) = \frac{1}{2} \times \$10 \times 100 = \$500$$

(c) (i) State that the government will grant a per-unit subsidy to consumers to achieve the socially optimal quantity of Good X and explain with **ONE** of the following: **1 point**

- A per-unit subsidy to consumers that internalizes external benefits increases the incentive and ability of consumers to buy the socially optimal quantity (400).
- A per-unit subsidy to consumers equal to the marginal external benefit increases consumption to the socially optimal quantity (400), by lowering the price paid by the consumer.
- A per-unit subsidy to consumers equal to the difference between marginal social benefit and marginal private benefit increases the quantity exchanged to the socially optimal quantity (400).

(ii) State that the dollar value of the per-unit subsidy is \$10. **1 point**

Total for part (c) 2 points

(d) State no, the price ceiling will not achieve the socially optimal quantity of Good X and explain that the price ceiling will cause the quantity exchanged in the market, which is limited by the quantity supplied (200), to be less than the socially optimal quantity (400). **1 point**

Total for question 2 5 points

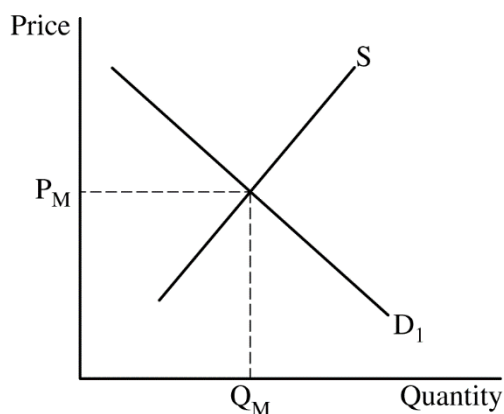
1. Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.
- (a) Assume Frank Sugar Co. is earning zero economic profit. Draw correctly labeled side-by-side graphs for the sugar market and Frank Sugar Co. and show each of the following.
- (i) The market equilibrium price and quantity, labeled P_M and Q_M , respectively
 - (ii) The profit-maximizing price and quantity for Frank Sugar Co., labeled P_F and Q_F , respectively
- (b) Assume the demand for sugar increases and sugar is produced in a constant-cost industry.
- (i) On your graph in part (a), show the short-run effect of the increased demand for sugar on the market price, labeled P_2 , and the quantity sold by Frank Sugar Co., labeled Q_N .
 - (ii) Compared to the equilibrium identified in part (a)(ii), what will happen to the short-run profit earned by Frank Sugar Co. as a result of the increased demand for sugar?
 - (iii) When the market adjusts to long-run equilibrium, how will the market price of sugar in the long run compare to P_2 ? Explain.
- (c) Instead, assume sugar consumption has a negative impact on public health over time and the negative impact of sugar on health is underestimated by consumers. Draw a correctly labeled graph of the market, with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.
- (i) The market equilibrium quantity, labeled Q_M
 - (ii) The socially optimal quantity, labeled Q_S
- (d) Assume the government decides to intervene in the market to affect consumers' incentives and to address the negative impact of sugar consumption on public health. Which of the following policies would best achieve that objective in the short run: a lump-sum tax, a per-unit tax, a lump-sum subsidy, or a per-unit subsidy? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

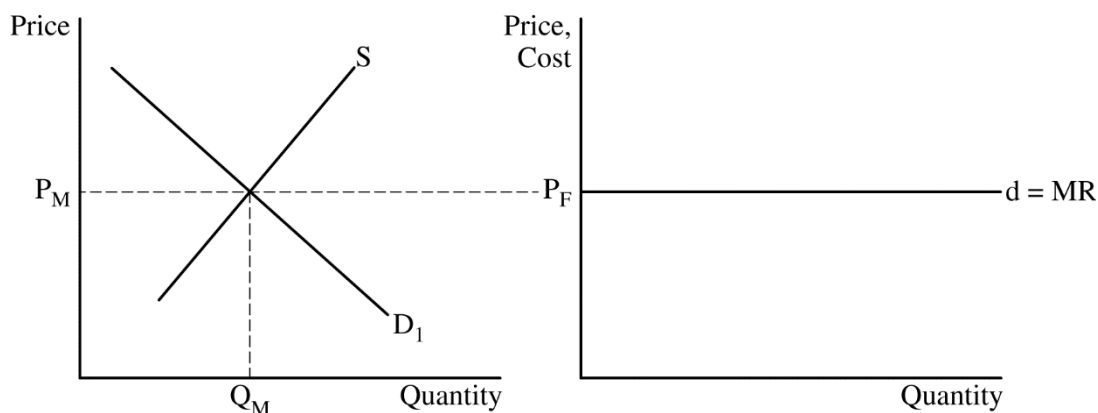
Question 1: Long

10 points

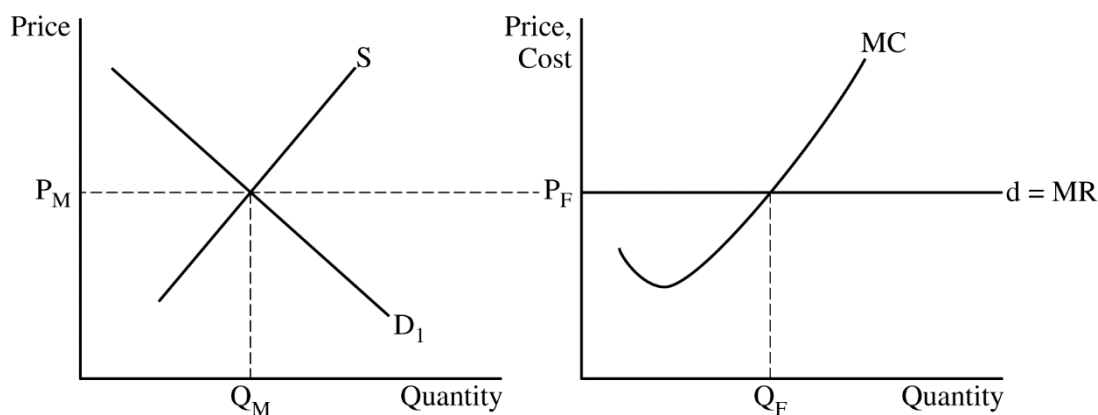
- (a) Draw a correctly labeled graph of the market for sugar and show the equilibrium price and quantity, labeled P_M and Q_M , respectively. **1 point**



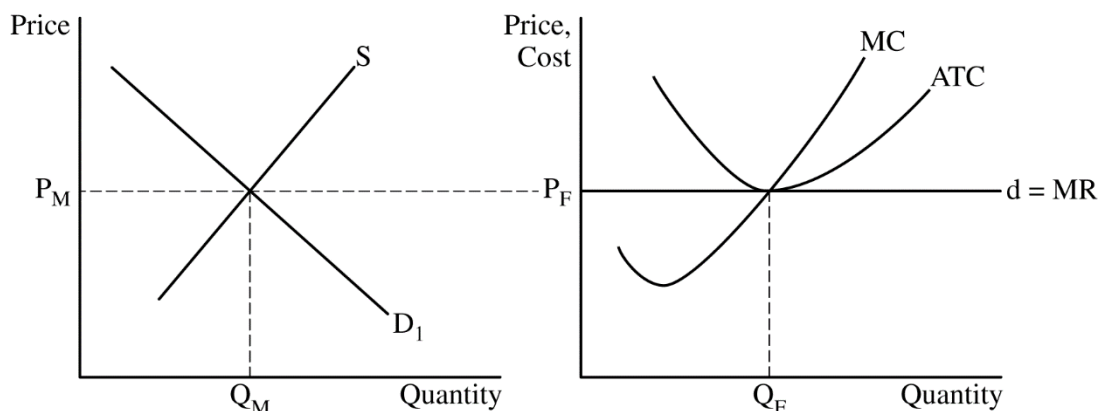
- For the second point, the graph must show a horizontal demand curve ($d = MR$) for Frank Sugar Co. and label the firm's profit-maximizing price P_F at P_M . **1 point**



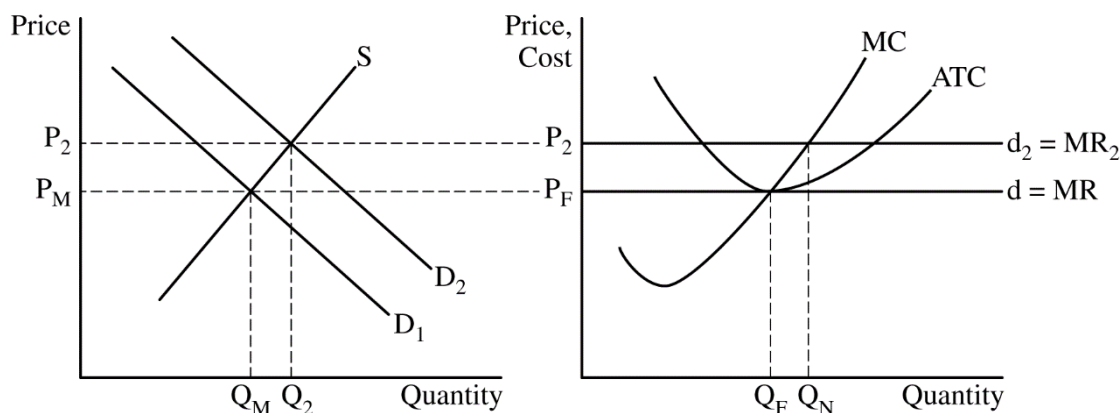
- For the third point, the graph must show the marginal cost (MC) curve and show the profit-maximizing quantity, labeled Q_F where $MR = MC$. **1 point**



For the fourth point, the firm's graph must show the average total cost (ATC) curve tangent to the firm's demand curve at Q_F and show the MC curve passing through the minimum point of the ATC curve.

1 point**Total for part (a) 4 points**

- (b)** On your market graph from part (a), show a rightward shift in the market demand curve with a higher market price, labeled P_2 , and show an upward shift in the firm's demand curve with a greater quantity sold by Frank Sugar Co., labeled Q_N .

1 point

State that the profit earned by Frank Sugar Co. will increase in the short run.

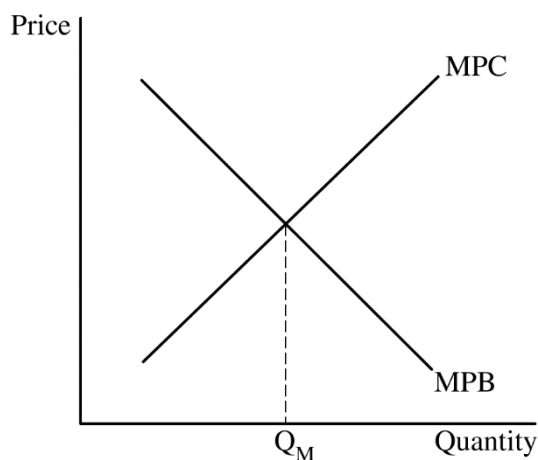
1 point

State that the market price in long-run equilibrium will be lower than P_2 and explain that new firms will enter the market, which increases the market supply, lowering the market price back to P_M where firms earn zero economic profit in the long run.

1 point**Total for part (b) 3 points**

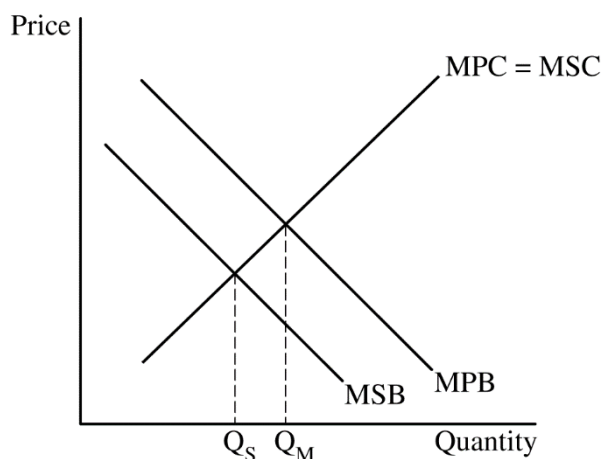
- (c) Draw a correctly labeled graph with an upward-sloping supply curve, labeled MPC, a downward-sloping demand curve, labeled MPB, and show the market equilibrium quantity, labeled Q_M at the intersection of the MPB and MPC curves.

1 point



For the second point, the graph must show a downward-sloping marginal social benefit (MSB) curve below the MPB curve, label the upward sloping curve $MPC = MSC$, and show the socially optimal quantity, labeled Q_S , at the intersection of the MSB and MSC curves.

1 point



Total for part (c) 2 points

- (d) State that the government would impose a per-unit tax and explain that the tax would raise the price paid per unit **AND** decrease market equilibrium quantity to move it closer to the socially optimal quantity.

1 point

Total for question 1 10 points

TOPIC 6.3

Public and Private Goods

SUGGESTED SKILL

 *Principles and Models*

1.B

Identify an economic concept, principle, or model illustrated by an example.

Required Course Content

ENDURING UNDERSTANDING

POL-3

Private incentives can fail to account for all socially relevant considerations.

LEARNING OBJECTIVE

POL-3.C

- Define whether goods are rival and/or excludable.
- Explain how the nature of rival and/or excludable goods influences the behavior of individuals and groups.

ESSENTIAL KNOWLEDGE

POL-3.C.1

Private goods are rival and excludable, and public goods are non-rival and non-excludable.

POL-3.C.2

Due to the free rider problem, private individuals usually lack the incentive to produce public goods, leaving government as the only producer.

POL-3.C.3

Governments sometimes choose to produce private goods, such as educational services, and to allow free access to them.

POL-3.C.4

Some natural resources are, by their nature, non-excludable and rival and therefore open access. Private individuals inefficiently overconsume such resources.

-
- A. Most goods and services are provided through markets, but sometimes markets fail to provide a necessary good or service because firms cannot profitably provide them because they face what is called the free rider problem. It is up to the government to provide these public goods which cannot be withheld from non-payers.
1. What makes some goods suitable to being produced by the government and paid for by tax money rather than being allocated in the private market?
 - i. Public goods are typically non-rival and non-excludable. Examples include police protection, national defense, and most bridges and public highways.
 - ii. Private goods can be rival or non-rival, but they are always excludable. Examples include candy bars, concerts, haircuts, cars, and houses. Sometimes government may choose to produce private goods to allow free access to those who cannot pay.
 - iii. A good or service is rival if one person's consumption prevents another person from consuming that unit of the good or service.
 - iv. A good or service is non-rival if one person's consumption does not diminish the ability of another person to consume the same good or service.
 - v. A good or service is excludable if it can be withheld from those who are either unable or unwilling to pay.
 - vi. A good or service is non-excludable if it cannot be withheld from those unwilling or unable to pay.
 2. Some natural resources like forests, pastures and fisheries may be over consumed because property rights are not clearly defined. This is referred to as the tragedy of the commons. Solutions to the tragedy of the commons can come from either the government or private individuals. Governments may regulate or license access to certain natural resources. Private individuals may create agreements on how to best use a common resource.

1. Define the following:
 - excludable
 - free-rider problem
 - private good
 - public good
 - rival
 - tragedy of the commons
2. Explain why a sandwich is a private good, but a highway is a public good.
3. What's the key difference between private school and public school, rivalry or excludability? Explain.
4. If a good or service is non-rival and non-excludable, then why will private firms and individuals typically not supply them.
5. An economist interested in protecting sea-turtle eggs from overconsumption due to poaching suggested assigning property rights to sea turtle nests to the poachers. Explain how assigning property rights to the poachers might reduce overconsumption of natural resources.

1. Define the following:

excludable

free-rider problem

Firms have little incentive to provide goods or services which they cannot withhold from those unwilling to pay

private good

good which is excludable from those who do not pay for it

public good

Good which is non-excludable and often, but not always non-rival

rival

one person's use precludes another person's use of the same good or service

tragedy of the commons

Absence of clearly defined property rights for natural resources often results in overconsumption of the resource.

2. Explain why a sandwich is a private good, but a highway is a public good.

Sandwiches can be withheld from those who do not pay, while a highway is accessible both to those who

3. What's the key difference between private school and public school, rivalry or excludability? Explain.

Excludability. Those unwilling or unable to pay for private education can be excluded from consuming it. Public schools

4. If a good or service is non-rival and non-excludable, then why will private firms and individuals typically not supply them.

There is no way to prevent "free-riders", and thus very little opportunity to profit from providing the good

5. An economist interested in protecting sea-turtle eggs from overconsumption due to poaching suggested assigning property rights to sea turtle nests to the poachers. Explain how assigning property rights to the poachers might reduce overconsumption of natural resources.

Given clearly defined property rights over a nest or even the turtles provides the poacher with the

SUGGESTED SKILL

 *Graphing and Visuals*

4.C

Demonstrate the effect of a change in an economic situation on an accurately labeled graph or visual.

TOPIC 6.4

The Effects of Government Intervention in Different Market Structures

Required Course Content

ENDURING UNDERSTANDING

POL-4

In imperfect markets, well-designed government policy can reduce waste.

LEARNING OBJECTIVE

POL-4.A

- Define government policy interventions in imperfect markets.
- Explain (using graphs where appropriate) how government policies can alter market outcomes in perfectly and imperfectly competitive markets.
- Calculate (using data from a graph or table as appropriate) changes in market outcomes resulting from government policies in perfectly competitive and imperfectly competitive markets.

ESSENTIAL KNOWLEDGE

POL-4.A.1

Per-unit taxes and subsidies affect the total price consumers pay, net price firms receive, equilibrium quantity, consumer and producer surpluses, deadweight loss, and government revenue or cost. The impact of change depends on the price elasticity of demand and supply.

POL-4.A.2

Lump-sum taxes and lump-sum subsidies do not change either marginal cost or marginal benefit; only fixed costs will be affected.

POL-4.A.3

Binding price ceilings and floors affect prices and quantities differently depending on the market structures (perfect competition, monopoly, monopolistic competition, and monopsony) and the price elasticities of supply and demand.

continued on next page

LEARNING OBJECTIVE

POL-4.A

- Define government policy interventions in imperfect markets.
- Explain (using graphs where appropriate) how government policies can alter market outcomes in perfectly and imperfectly competitive markets.
- Calculate (using data from a graph or table as appropriate) changes in market outcomes resulting from government policies in perfectly competitive and imperfectly competitive markets.

ESSENTIAL KNOWLEDGE

POL-4.A.4

Government intervention in imperfect markets can increase efficiency if the policy correctly addresses the incentives that led to the market failure.

POL-4.A.5

Government can use price regulation to address inefficiency due to monopoly.

POL-4.A.6

A natural monopoly will require a lump-sum subsidy to produce at the allocatively efficient quantity.

POL-4.A.7

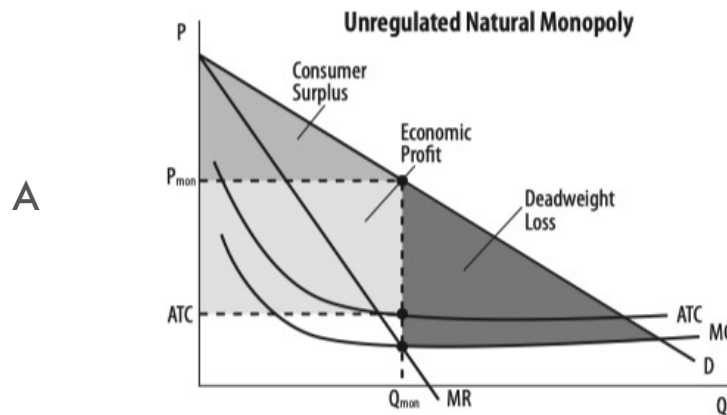
Governments use antitrust policy in an attempt to make markets more competitive.

✖ Exclusion:

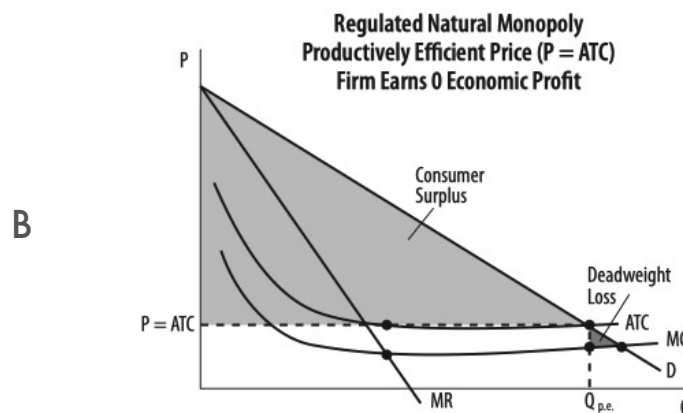
A graph of inefficiency and policy due to collusion is beyond the scope of the course and the AP Exam.

A. Imperfectly competitive markets such as monopolistic competition, oligopoly, and monopoly are examples of market failures. They do not provide the socially optimal price and quantity of a good or service.

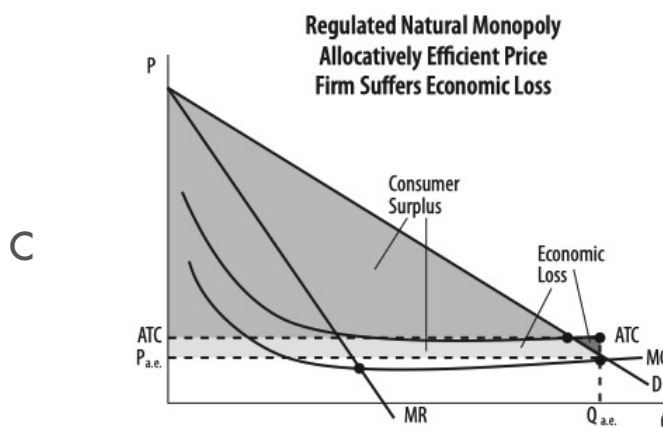
1. The government uses antitrust laws to either break up or regulate some imperfectly-competitive firms such as monopolies in order to promote competition and efficiency.
2. In the following graphs compare the differences between the unregulated and the regulated natural monopoly.
3. Graph A shows an unregulated natural monopoly. The unregulated natural monopoly produces less output at a higher price than it would if it were regulated for either productive efficiency ($P = ATC$) or allocative efficiency ($P = MC$).



4. Graph B illustrates a natural monopoly regulated to produce at a productively efficient quantity and price. The result is a higher quantity and lower price than the unregulated natural monopoly seen in A. However, deadweight loss still exists because the price is greater than the marginal cost.

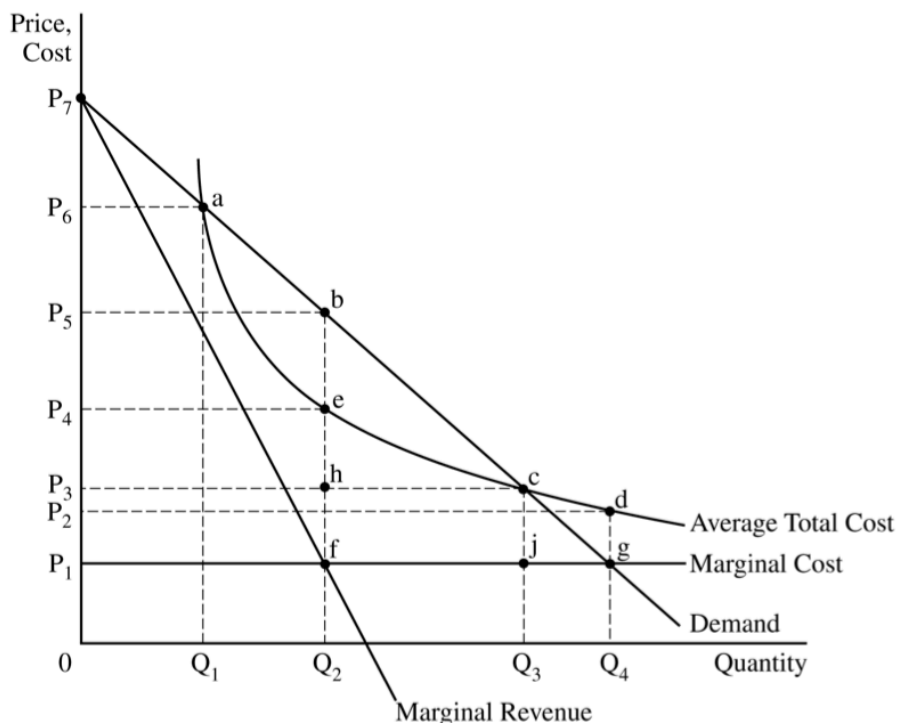


5. If the government wants the natural monopoly to produce at the allocatively efficient quantity, then they will set the price equal to the marginal cost and provide lump sum subsidy to offset the firm's losses as seen in Graph C.



1. Define the following:
 antitrust policy
 binding price ceiling
 binding price floor

Refer to the following diagram to answer 2 - 5.



2. What specific market structure is being illustrated in this diagram?
3. Identify the profit maximizing quantity and price for this firm.
4. Identify consumer surplus, deadweight loss, and profit for the firm based on the profit maximizing quantity and price you identified in 3.
5. Identify the socially optimal price and quantity, and explain what the government must do to bring about social efficiency.

1. Define the following:

antitrust policy

Laws which prohibit practices like collusion, cartels, certain monopolies, and certain forms of price discrimination

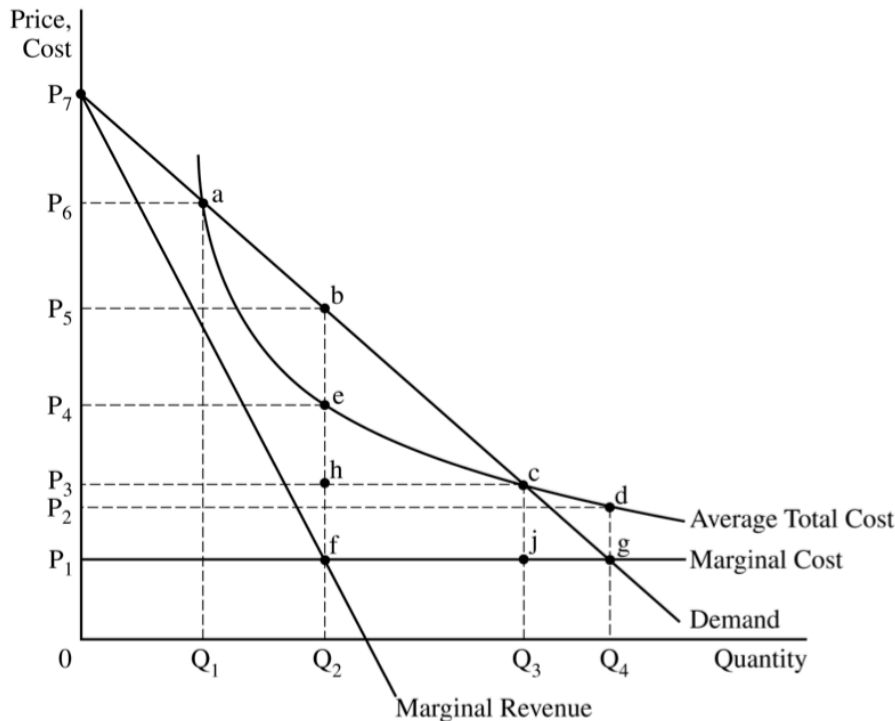
binding price ceiling

A legal maximum price

binding price floor

A legal minimum price

Refer to the following diagram to answer 2 - 5.



2. What specific market structure is being illustrated in this diagram?

Single price, natural monopoly

3. Identify the profit maximizing quantity and price for this firm.

P5, Q2

4. Identify consumer surplus, deadweight loss, and profit for the firm based on the profit maximizing quantity and price you identified in 3.

Consumer surplus = P7, b, P5

Deadweight loss = b, f, g

Profit = P5, P4, b, e

5. Identify the socially optimal price and quantity, and explain what the government must do to bring about social efficiency.

P1, Q4. The government must set a binding price ceiling of P1 and provide a lump-sum subsidy to the firm = d, g, P2, P1

1. A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.
- (a) Draw a correctly labeled graph for the firm and show each of the following.
- (i) The quantity of carbon-capture devices produced by the firm, labeled Q_M
 - (ii) The price charged by the firm, labeled P_M
 - (iii) The area representing consumer surplus, shaded completely
- (b) The government is considering different options to regulate the firm.
- (i) Suppose the government is considering taxing the firm. Could using a per-unit tax change the firm's output to the socially optimal quantity? Explain.
 - (ii) Instead, suppose the government imposes a price ceiling so that the firm produces the socially optimal quantity. On your graph in part (a), label the quantity and price after the price ceiling is imposed as Q_C and P_C .
 - (iii) At the price and the quantity identified in part (b)(ii), is the firm earning positive economic profit? Explain.
- (c) Assume the government decides not to regulate the firm and instead the firm produces the quantity of output that maximizes total revenue.
- (i) If the firm now increases its output by one unit, would marginal revenue be positive, negative, or zero? Explain.
 - (ii) Starting at the total-revenue-maximizing quantity, if the firm reduces the price by 10%, would the quantity demanded increase by less than 10%, by more than 10%, or by exactly 10% ?

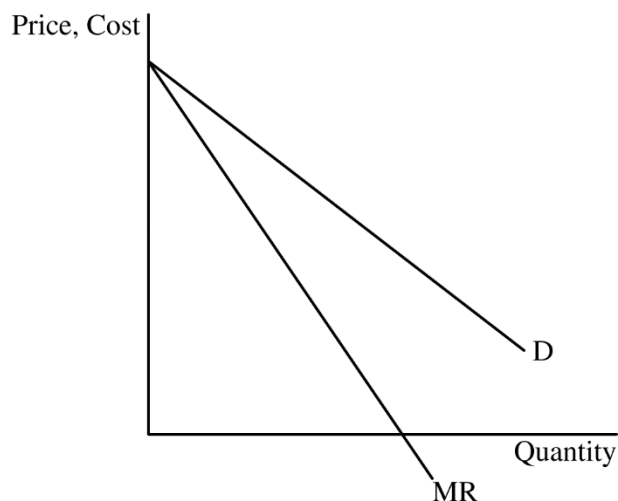
Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Question 1: Long

10 points

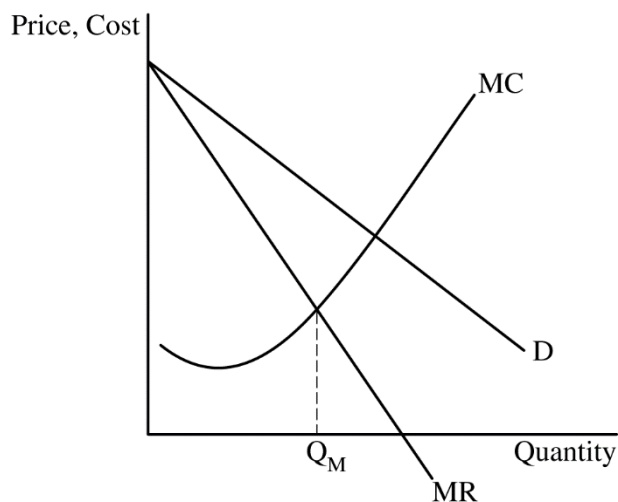
- (a) Draw a correctly labeled graph for a monopoly showing downward-sloping demand (D) and marginal revenue (MR) curves with the MR curve below the demand curve.

1 point

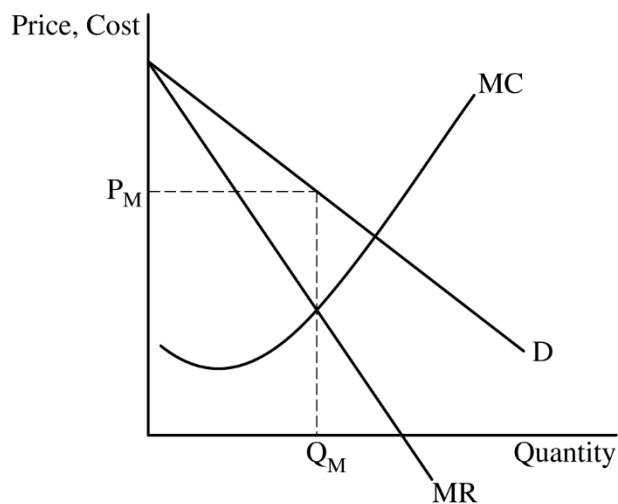


For the second point, the graph must show the marginal cost (MC) curve and the profit-maximizing quantity, labeled Q_M , where $MR=MC$.

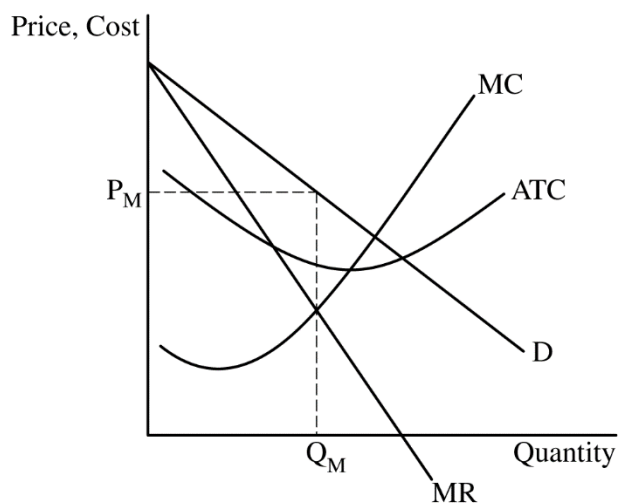
1 point



For the third point, the graph must show the profit-maximizing price, labeled P_M , from the demand curve at Q_M .

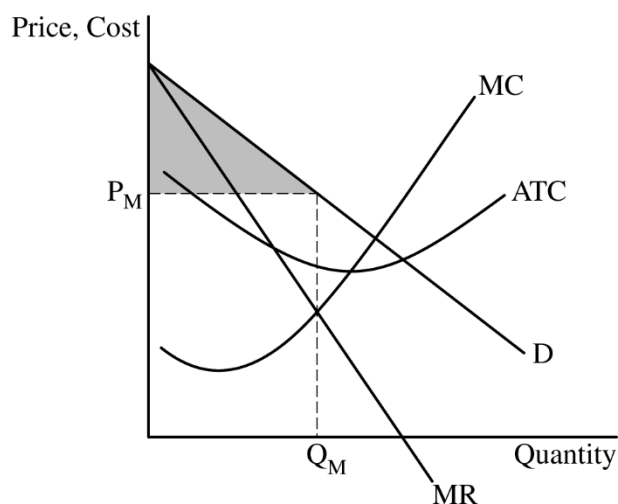
1 point

For the fourth point, the graph must show the average total cost (ATC) curve below the demand curve at Q_M and show the MC curve passing through the minimum point of the ATC curve.

1 point

For the fifth point, the graph must show a completely shaded area of the consumer surplus.

1 point



Total for part (a)

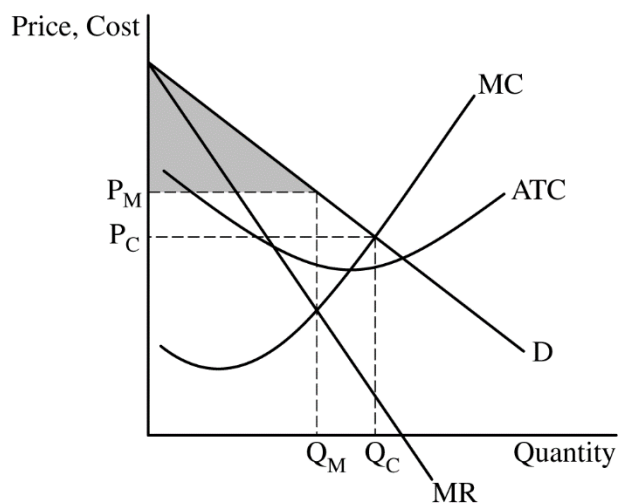
5 points

- (b)(i) State no and explain that a per-unit tax would shift the MC curve upward and intersect the MR curve at a lower quantity, which decreases the firm's profit-maximizing quantity, not increases it to the socially optimal quantity where $MC=D$.

1 point

- (ii) On your graph from part (a), show the socially optimal quantity labeled as Q_C and the price ceiling labeled as P_C at $MC=D$.

1 point



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- | | | |
|--------------|--|----------------|
| (iii) | State that the firm is earning positive economic profit and explain that ATC is less than P_C at Q_C , as shown. | 1 point |
|--------------|--|----------------|

Scoring Note: The answer should be consistent with the position of the ATC curve with respect to the demand curve at Q_C on the graph drawn in part (b)(ii). The firm will not earn positive economic profit if the ATC curve is drawn such that $ATC > P_C$ or $ATC = P_C$ at Q_C .

Total for part (b)	3 points
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|----------------|---|----------------|
| (c) (i) | State that marginal revenue will be negative and explain that after total revenue is maximized, TR decreases since the firm moves onto the inelastic portion of the demand curve. | 1 point |
|----------------|---|----------------|

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- | | | |
|-------------|--|----------------|
| (ii) | State that the percentage increase in quantity demanded will be less than 10%. | 1 point |
|-------------|--|----------------|

Total for part (c)	2 points
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Total for question 1	10 points
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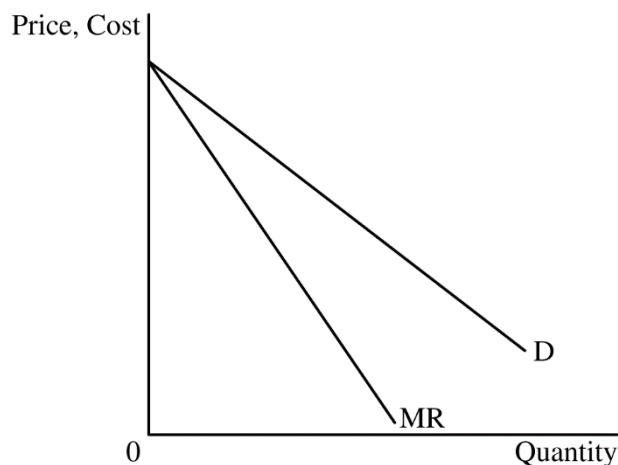
1. RKB is a profit-maximizing monopoly that produces a new, patented electronic device. RKB is earning positive economic profit.
- (a) Draw a correctly labeled graph for RKB, and show each of the following.
- (i) The profit-maximizing quantity, labeled Q_M
 - (ii) The profit-maximizing price, labeled P_M
 - (iii) The average total cost curve consistent with RKB earning positive economic profit
 - (iv) The area representing the deadweight loss, shaded completely
- (b) The government wants RKB to produce the allocatively efficient quantity. Would the government impose a binding price ceiling, a binding price floor, a per-unit tax, or a lump-sum tax?
- (c) Suppose that the government does not impose the policy you identified in part (b). Consumers now become aware of research that confirms the use of this new device harms users' vision. Given widespread consumer awareness of this research, what will happen to RKB's profit-maximizing quantity in the short run? Explain.
- (d) Assume that RKB hires workers in a perfectly competitive labor market.
- (i) Draw a correctly labeled graph for the labor market, showing the equilibrium wage and quantity of labor, labeled W_E and Q_E , respectively.
 - (ii) Suppose immigration increases the number of workers in this labor market. On your graph in part (d)(i), show the new equilibrium wage and quantity of labor, labeled W_2 and Q_2 , respectively.
 - (iii) RKB uses the optimal combination of capital and labor in its production process. The firm rents capital at \$500 per unit, and the last unit of capital rented has a marginal product of 2,500 units. If the marginal product of the last unit of labor hired is 1,000 units, calculate the wage rate. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

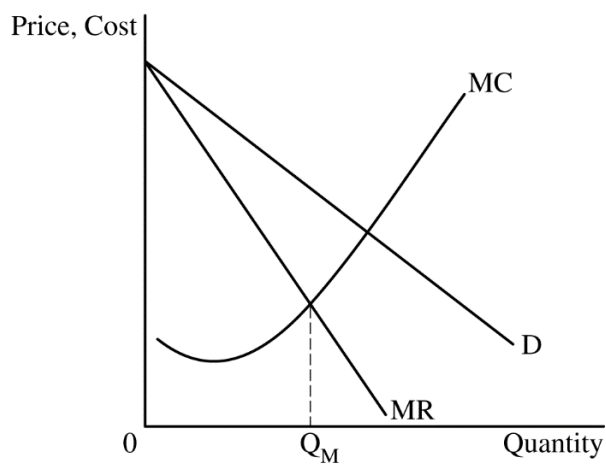
Question 1: Long

10 points

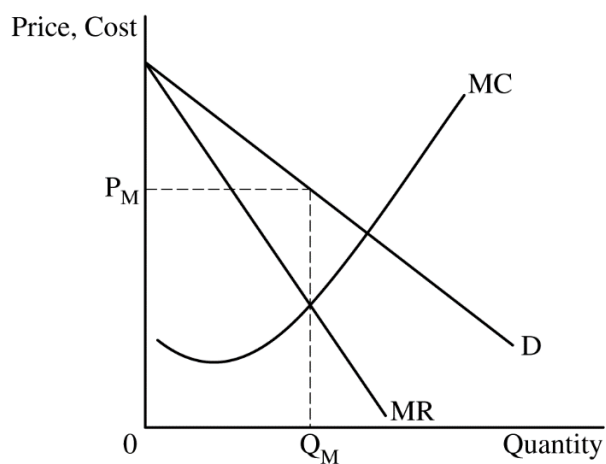
- (a) Draw a correctly labeled graph of a monopoly with a downward-sloping demand (D) curve and a downward-sloping marginal revenue (MR) curve with the MR curve below the D curve. 1 point



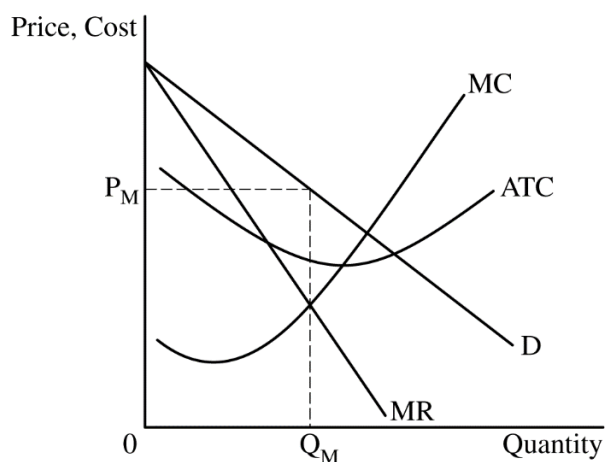
- For the second point, the graph must show a marginal cost (MC) curve and the profit-maximizing quantity, labeled Q_M , where $MR = MC$. 1 point



For the third point, the graph must show the profit-maximizing price, labeled P_M , from the demand curve at Q_M .

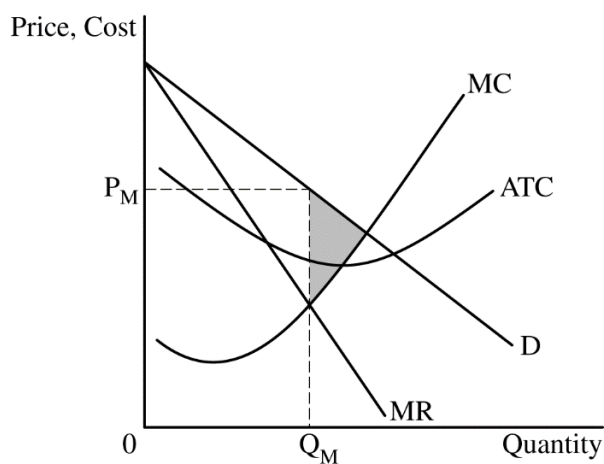
1 point

For the fourth point, the graph must show the average total cost (ATC) curve below P_M at Q_M and the MC curve passing through the minimum point of the ATC curve.

1 point

For the fifth point, the graph must show the area of the deadweight loss, shaded completely.

1 point

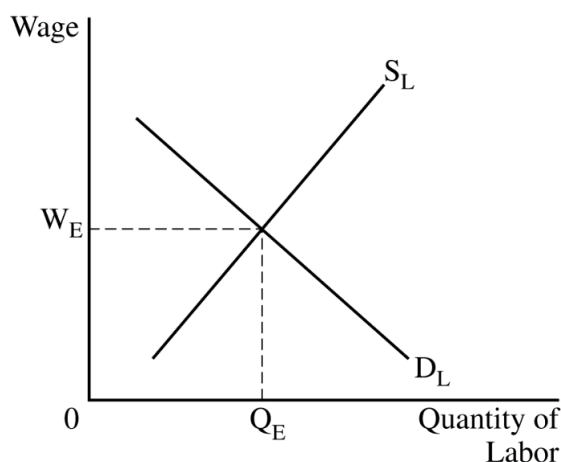


Total for part (a) 5 points

- | | | |
|------------|---|----------------|
| (b) | State that the government would impose a binding price ceiling. | 1 point |
| (c) | State that the profit-maximizing quantity will decrease and explain that the demand for the device will decrease, causing the MR curve to shift to the left, intersecting the MC curve at a lower quantity. | 1 point |

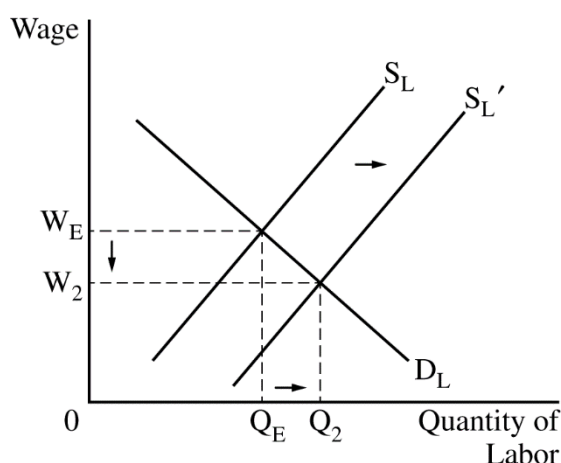
- (d)(i)** Draw a correctly labeled graph of a perfectly competitive labor market with a downward-sloping demand (D) curve and an upward-sloping supply (S) curve and show the equilibrium wage and quantity of labor, labeled W_E and Q_E , respectively.

1 point



- (d)(ii)** The graph from part (d)(i) must show a rightward shift in the labor supply curve, resulting in a lower equilibrium wage rate, labeled W_2 , and a higher equilibrium quantity of labor, labeled Q_2 .

1 point



- (d)(iii)** Calculate the wage rate as \$200 and show your work.

1 point

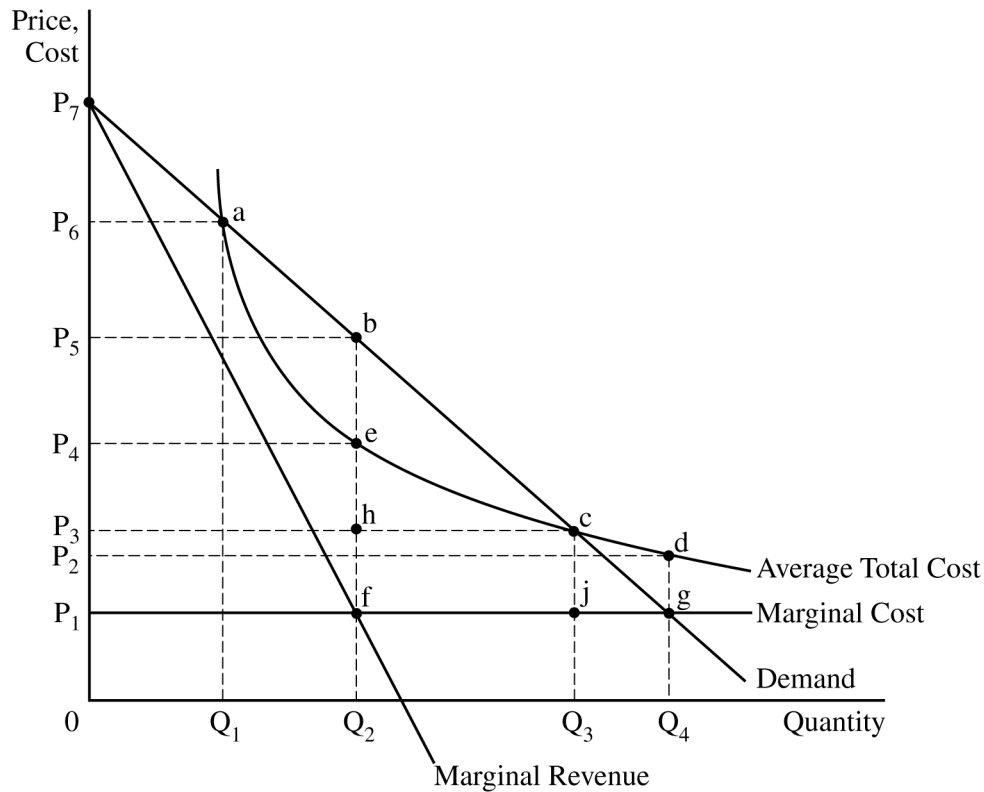
$$\frac{\text{Marginal Product of Capital}}{\text{Rental Price}} = \frac{\text{Marginal Product of Labor}}{\text{Wage Rate}}$$

$$\frac{2,500}{\$500} = \frac{1,000}{\text{Wage Rate}}$$

$$\text{Wage Rate} = \$200$$

Total for part (d) 3 points

Total for question 1 10 points



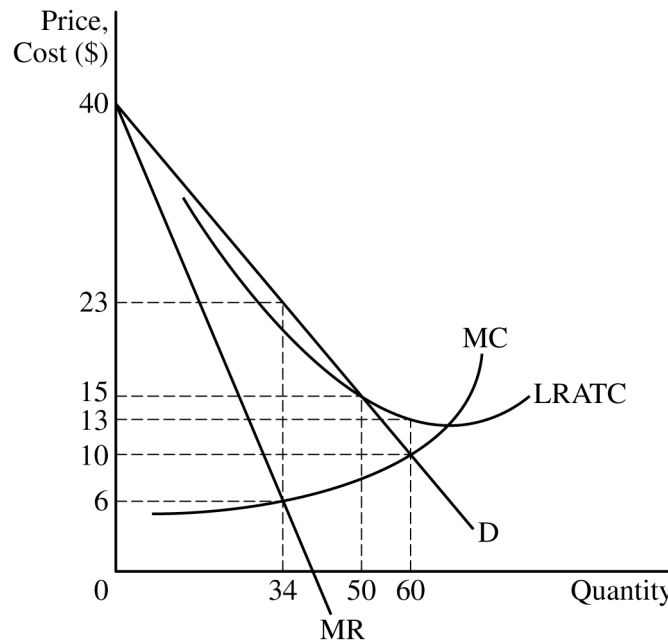
3. The graph shows the cost and revenue curves for an unregulated, profit-maximizing monopoly.
- Is the firm shown in this graph a natural monopoly? Explain.
 - Using the labeling from the graph, identify the area representing the deadweight loss for this profit-maximizing monopoly.
 - In order to improve resource allocation, the government sets a price that results in the firm earning zero economic profit.
 - Using the labeling from the graph, identify the price and resulting quantity the firm would produce.
 - Will this government policy eliminate the deadweight loss? Explain using labeling from the graph.
 - Instead, the government decides to set a price that results in the socially optimal quantity of output. Will the firm earn positive, negative, or zero economic profit? Explain using labeling from the graph.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Question 3: Short**5 points**

(a)	State yes and explain that this firm is a natural monopoly because it experiences decreasing average total costs over the entire effective demand for its product.	1 point
(b)	State the area of deadweight loss is equal to ONE of the following areas: • bfg • $\frac{1}{2} \times (P_5 - P_1) \times (Q_4 - Q_2)$	1 point
(c)(i)	State the regulated price is P_3 and the regulated quantity is Q_3 .	1 point
(ii)	State no and explain with ONE of the following. • Area cjk is the remaining deadweight loss. • The deadweight loss is reduced by area bfjc but is not eliminated completely. • P_3 is greater than (or not equal to) marginal cost at Q_3. • Q_3 is less than (or not equal to) the socially optimal quantity Q_4.	1 point
Total for part (c)		2 points
(d)	State the firm will earn negative economic profit and explain with ONE of the following: • At the socially optimal quantity, Q_4, average total cost (P_2) is greater than price (P_1). • At the socially optimal quantity, Q_4, the area of negative economic profit is P_1P_2dg. • At the socially optimal quantity, Q_4, the area of negative economic profit is $(P_2 - P_1) \times Q_4$.	1 point
Total for question 3		5 points

3. The graph provided shows the demand (D), long-run average total cost (LRATC), marginal cost (MC), and marginal revenue (MR) curves for a natural monopoly.



- (a) Over the output range of 0 to 60 units, is this firm experiencing economies of scale, diseconomies of scale, or constant returns to scale? Explain.
- (b) Using numbers from the graph, identify the price and quantity produced at which the monopolist earns zero economic profit.
- (c) Assume that regulators impose a price ceiling that results in the firm producing the socially optimal quantity in the short run.
- Calculate the total revenue at the price ceiling. Show your work.
 - Explain why the firm requires a subsidy to continue producing in the long run.
 - Calculate the lump-sum subsidy that would be required for the monopolist to produce the socially optimal quantity in the long run. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Question 3: Short**5 points**

(a) State that the firm is experiencing economies of scale and explain that the long-run average total cost (LRATC) curve is downward sloping over the range of 0 to 60 units. **1 point**

(b) State that the price is \$15 and the quantity is 50 units. **1 point**

(c) (i) Calculate the total revenue at the socially optimal quantity as \$600 and show your work. **1 point**

$$\text{Total Revenue} = \text{Price} \times \text{Quantity} = \$10 \times 60 = \$600$$

(ii) Explain that at the socially optimal quantity, the firm is earning negative economic profit in the short run because price is less than average total cost. **1 point**

(iii) Calculate the lump-sum subsidy as \$180 and show your work. **1 point**

$$\text{Lump-sum Subsidy} = (\text{LRATC} - \text{Price}) \times \text{Quantity} = (\$13 - \$10) \times 60 = \$180$$

Total for part (c) 3 points

Total for question 3 5 points

SUGGESTED SKILL

 *Principles and Models*

1.A

Describe economic concepts, principles, or models.

TOPIC 6.5

Inequality

Required Course Content

ENDURING UNDERSTANDING

POL-5

Market outcomes can result in income inequality.

LEARNING OBJECTIVE

POL-5.A

Define measures of economic inequality in income and wealth.

POL-5.B

Explain sources of income and wealth inequality.

ESSENTIAL KNOWLEDGE

POL-5.A.1

Income levels and poverty rates vary greatly both across and within groups (e.g., age, gender, race) and countries.

POL-5.A.2

The Lorenz curve and Gini coefficient are used to represent the degree of inequality in distributions and to compare distributions across different countries, policies, or time periods.

X Exclusion:

Drawing the Lorenz curve and calculating Gini coefficients are beyond the scope of the course and the AP Exam.

POL-5.B.1

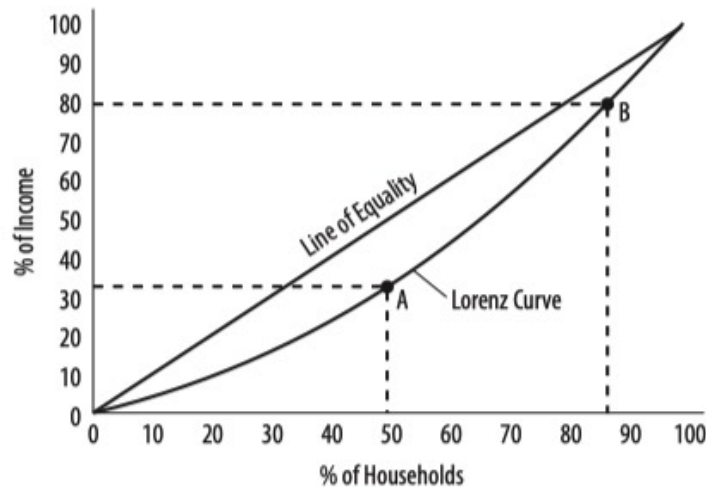
Each factor of production receives the value of its marginal product, which can contribute to income inequality.

POL-5.B.2:

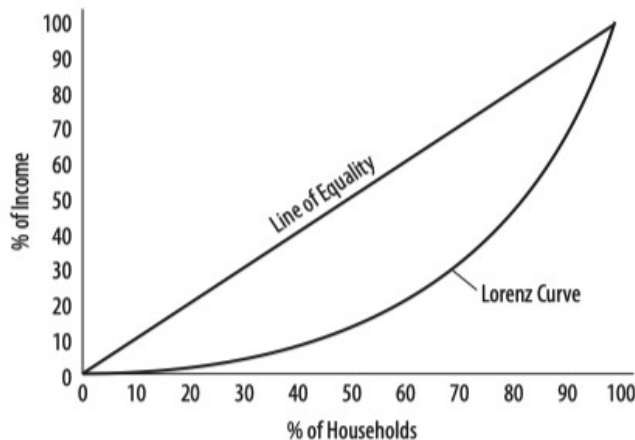
Sources of income and wealth inequality include differences in tax structures (progressive and regressive tax structures), human capital, social capital, inheritance, effects of discrimination, access to financial markets, mobility, and bargaining power within economic and social units (firms, labor unions, and families).

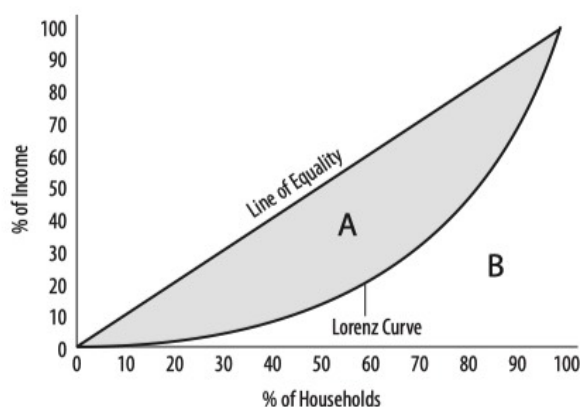
A. Equity

1. Markets fail to allocate income equally. Some households earn more income while others earn less.
2. Differences in worker productivity, changing trade patterns, past discrimination, and tax policies are some of the reasons for differences in incomes between households. For example, an increase in demand for skilled labor and a decrease in demand for unskilled labor results in less income equality as skilled workers' incomes rise and unskilled workers' incomes fall.
3. Two measures of income equality are the Lorenz Curve and the Gini Coefficient.
4. The Lorenz Curve is a graph of income inequality that shows the percentage of a country's income earned by a percentage of a country's households.
5. Below, the 45-degree line represents perfect income equality. The bowed-out line is the Lorenz Curve for the country and shows the distribution of income.



6. In the Lorenz Curve above, the bottom half of the population earns only 33 percent of the income, which also means that the top half of households earn two-thirds of the nation's income. Point B shows that 88 percent of the households earn 80 percent of the income, meaning that the highest earning 12 percent of households earn 20 percent of the income in the society.
7. As the Lorenz Curve gets further away from the line of equality, the amount of income inequality in a country increases.





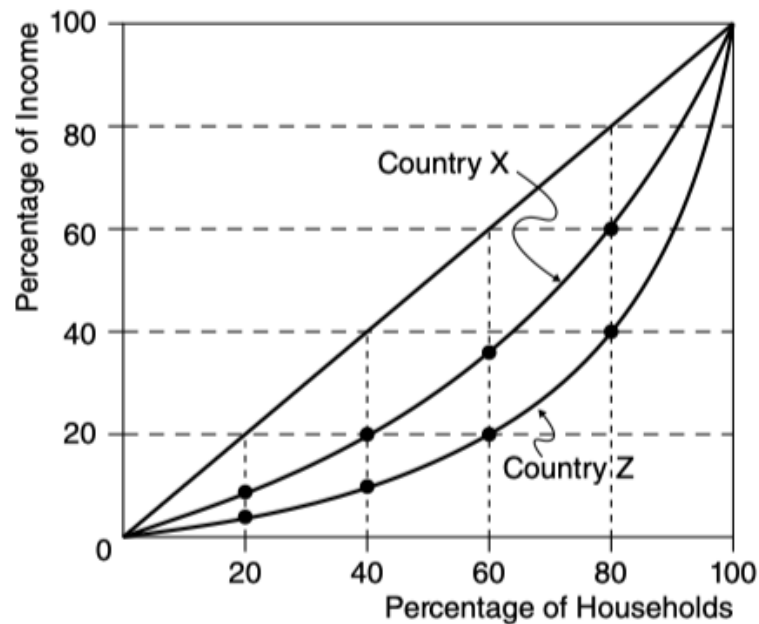
8. A related measure of income inequality is the Gini Coefficient. The Gini Coefficient compares the area between the line of equality and a Lorenz curve with the total area under the line of equality.
9. In the graph above, the Gini Coefficient is equal to area A divided by the sum of areas A and B. Gini Coefficient = $(A / A + B)$.
10. The Gini Coefficient ranges from zero to one.
11. A Gini Coefficient of zero means perfect income equality. Every household earns an equal amount of income, and the society's Lorenz Curve is the line of equality. Area A equals zero.
12. A Gini Coefficient of one means perfect income inequality. One household earns all of the income while the rest earn nothing. In this case the area B is zero, which means that the society's Lorenz Curve follows the x-axis until 100 percent and then jumps vertically upward to the point (100 percent, 100 percent).
13. In the real world, Gini Coefficients fall somewhere in between the two extremes. Gini Coefficients closer to zero mean income is more equally distributed, while Gini Coefficients closer to one mean that the income distribution is more unequal.

B. Tax Progressivity

1. Economists classify taxes according to how they reallocate income in an economy.
 - i. Progressive taxes are those taxes that take a higher percentage of the income of high-income earners than from low-income earners. The effect of progressive taxes is to make the income distribution more equal. An example of a progressive tax is the federal income tax (at least in theory). Other examples include the estate tax and gift taxes.
 - ii. Regressive taxes are those that take a lower percentage of the income of high-income earners than of low-income earners. The effect of regressive taxes is to make the income distribution less equal. Sales tax is an example of a regressive tax because high-income earners pay tax only on the income they spend, and they save more than low income earners.
 - iii. Proportional taxes place an equal burden on all household income levels and should not affect the distribution of income. A flat-rate tax on income or a tithe are examples of proportional taxes.

1. Define the following:
 - income inequality
 - gini coefficient
 - Lorenz curve
 - progressive tax
 - proportional tax
 - regressive tax

Refer to the following diagram of a Lorenz Curve to respond to 2 - 5

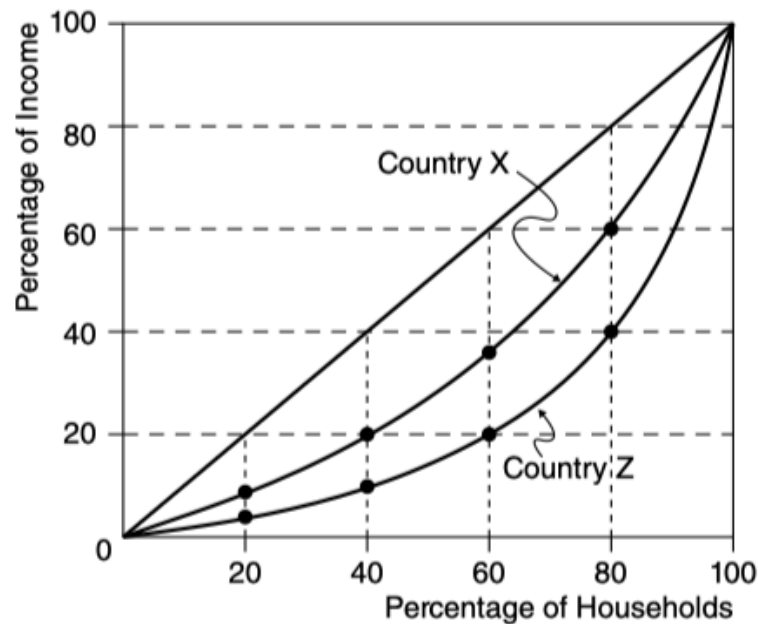


2. According to the Lorenz curve for country X, the top 20% of households earn what percentage of total income in country X.
3. Which country has a higher Gini coefficient?
4. Country Z is considering implementing a tax and redistribution system to reduce income inequality. What kind of tax would be best suited for this purpose, progressive, proportional, or regressive?
5. Identify three sources of income inequality in a country.

1. Define the following:

income inequality	Incomes are not equally distributed in economies
gini coefficient	Measure of income inequality = to the ratio of the area between the Lorenz curve and the line of equality to the total area beneath the
Lorenz curve	A graph of income inequality in a country
progressive tax	Tax which takes a higher proportion of income from high earners than from low earners
proportional tax	Tax which takes the same proportion of income from all earners
regressive tax	Tax which takes a higher proportion of income from low earners than from high earners

Refer to the following diagram of a Lorenz Curve to respond to 2 - 5



2. According to the Lorenz curve for country X, the top 20% of households earn what percentage of total income in country X.

40%

3. Which country has a higher Gini coefficient?

Country Z

4. Country Z is considering implementing a tax and redistribution system to reduce income inequality. What kind of tax would be best suited for this purpose, progressive, proportional, or regressive?

Progressive

5. Identify three sources of income inequality in a country.

Differences in individual worker productivity, tax system, discrimination