

Economics 111  
Fall 2019  
November 12, 2019

Name ANNOTATED KEY

SECOND MIDTERM  
Version #1

There are multiple versions of this exam. You will be given a scantron to fill out. It is important that you:

- Fill out this scantron accurately and completely using a #2 pencil
- In "Special Codes" put your exam version number in column "A"

During the exam it is expected that you will always keep your answers for the exam covered. A failure to cover your answers may be grounds for an academic misconduct violation.

During the exam it is expected that you will always keep your eyes solely on your own exam. Violation of this expectation may be grounds for academic misconduct violation.

**This exam is 19 pages long!**

Binary Choice Questions (20 points)

\_\_\_\_\_

Multiple Choice Questions (60 points)

\_\_\_\_\_

Problem One (10 points)

\_\_\_\_\_

Problem Two (10 points)

\_\_\_\_\_

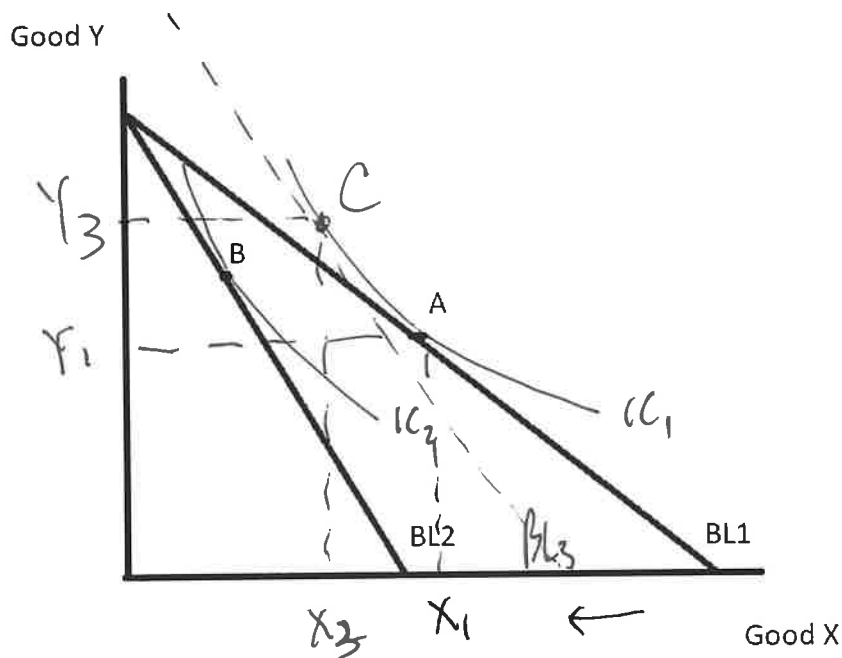
TOTAL out of 100 points

\_\_\_\_\_

**I. Binary Choice Questions (10 questions worth 2 points each)**

Use the following information to answer the **next two (2)** questions.

Consider the following diagram depicting Jane's initial budget line, BL1, and her new budget line, BL2. The graph also depicts the consumption bundles, A and B, that respectively represent her utility maximizing bundle of good X and good Y given her tastes and preferences, her income and the prices of the two goods. Assume that Jane has normal indifference curves.



*BL<sub>2</sub>: P<sub>x</sub> ↑ has increased  
Since we cannot buy as much of good X as we could w/ BL<sub>1</sub>*

1. From the graph you conclude that the price of good X has:

- a. Decreased.
- b. Increased.

2. If you construct budget line 3, BL3, which is the budget line where income has been adjusted so that Jane can have her initial level of utility while paying the new prices for good X and good Y, the optimal consumption bundle on this budget line will:

- a. result in Jane consuming more of good Y and less of good X than she did initially. ✓
- b. result in Jane consuming more of good X and less of good Y than she did initially.

*EASY*

*NOT TOO HARD.*

EASY

3. Economists can be so obsessive about signs and percentages. Which of the following statements best captures why economists have developed the arc price elasticity of demand formula?

- I. Percentages are so unreliable since your choice of starting point can generate different measures: let's alter the formula so that the calculation is always a positive number *\*not the reason*
- II. Percentages using the same set of numbers can be different depending upon choice of starting point: let's alter the formula to stabilize our measure so that choice of starting point is immaterial. ✓

- a. Statement I is the best statement about the arc elasticity formula.
- b. Statement II is the best statement about the arc elasticity formula.

HARDER

4. Suppose a market is initially in equilibrium. At this equilibrium the absolute value of the price elasticity of demand is larger than the absolute value of the price elasticity of supply. If the government imposes an excise tax, then a larger fraction of tax revenue is paid by the \_\_\_\_\_.



*D more elastic than S*

- a. Consumer
- b. Producer

NOT BAD

5. You are running a gummy bear factory and you know that the cross price elasticity of gummy bears with respect to the price of whiskey is negative. If you see that the price of whiskey increases then you should anticipate that the demand for gummy bears will:

$$\frac{\% \Delta Q^D \text{ gummy bears}}{\% \Delta \text{ Price of whiskey}} < 0 \quad \begin{matrix} \downarrow \\ \uparrow \end{matrix} \quad \begin{matrix} \ominus \\ \oplus \end{matrix}$$

- a. Increase.
- b. Decrease.

CHALLENGING

6. Jimmy produces 100 chairs at a cost of \$10 per chair. He hires 10 units of labor and 5 units of capital to produce these chairs. For simplicity we will assume that these are the only inputs he needs to produce his chairs and that the prices of all inputs stay constant. If Jimmy doubles the amount of all the inputs he hires, then:

- a. His total costs will be \$2000 and he will have increasing returns to scale if he produces more than 200 chairs with this new input combination. ✓
- b. His total costs will be greater than \$2000 and he will have decreasing returns to scale if he produces less than 200 chairs. ✓

$10 \text{ units } \uparrow L \left\{ \Rightarrow \text{total cost} = \text{total cost of producing} \right.$   
 $5 \text{ units } \uparrow K \left\{ \begin{matrix} 100 \text{ chairs at } \$10/\text{chair} \Rightarrow \$1000 \\ P_L, P_K \text{ don't change} \Rightarrow \text{total cost is } 2(1000) = \$2000 \end{matrix} \right.$   
 $20 \text{ units } \uparrow L \left\{ \right.$   
 $10 \text{ units } \uparrow K \left\{ \right.$   
 $ATC' = \frac{TC'}{Q'} = \frac{2000}{3Q} \Rightarrow ATC \downarrow \Rightarrow IRTS$

EASY

7. The income elasticity of demand for a product is -2. Then if income decreases by 10%, the quantity demanded for this product:

$$E_D = \frac{\% \Delta Q^D}{\% \Delta I} = -2$$

↓ by 10% =  $\frac{?}{-10\%}$

- a. Increases by 20%.
- b. Decreases by 5%.

? = ↑ by 20%

EASY

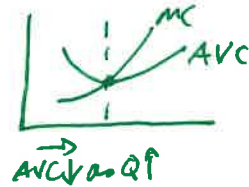
8. A monopolistically competitive firm will:

- a. earn positive economic profits in the long run just like a monopoly.
- b. earn zero economic profits in the long run just like a firm in a perfectly competitive industry.

EASY

9. You are told that a firm's average variable cost curve is decreasing as output increases. Given this information you know that:

- a. this firm's marginal cost is greater than its average variable cost.
- b. this firm's marginal cost is less than its average variable cost.



SOME THOUGHT

10. A perfectly competitive firm in the short run produces 10 units of the good and charges \$12 per unit for the good. This firm finds that its average total cost is \$11.75. From this information and holding everything else constant, you conclude that:

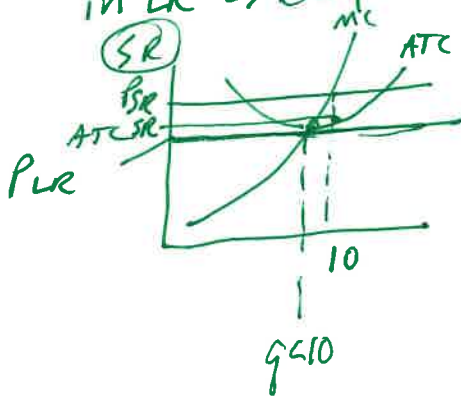
- a. in the long run, more firms will enter this industry and this firm will sell more than 10 units of the good. ✓
- b. in the long run, more firms will enter this industry and this firm will sell its product for a lower price per unit. ✓

$$P = \$12$$

$$ATC = 11.75$$

$$\pi_{SR} = PQ - ATC(Q) > 0$$

$$\text{in LR} \Rightarrow \text{entry} \Rightarrow P \downarrow, \pi_{\text{firm}} = 0 \Rightarrow P = ATC \text{ in LR}$$



**II. Multiple Choice Questions (20 questions worth 3 points each)**

11. Use the following information about Ginger's total utility she gets from consuming different amounts of good X and good Y to answer this question. Ginger has \$100 she can spend on these two goods and the price of good X is \$10 per unit and the price of good Y is \$5 per unit. Assume that Ginger spends the entire \$100 on these two goods. You are also told that:

Marginal Utility of good X:  $MU_x = 2Y$   
 Marginal Utility of good Y:  $MU_y = 2X$

Given this information and holding everything else constant, how many of the following statements are true?

- Ginger's budget line can be written as  $20 = 2X + Y$ . ✓
- Ginger's optimal consumption bundle is  $(X, Y) = (10, 5)$ . X optimal bundle is  $(X, Y) = (5, 10)$
- Ginger's optimal consumption bundle will be that bundle that sits on the highest indifference curve she can reach given her income and the prices she faces and where that consumption bundle is just tangent to her budget line. True
- At the optimal consumption bundle Ginger's marginal utility per dollar from good X is less than Ginger's marginal utility per dollar from good Y. False <sup>X</sup> equals to

- a. One statement is true.
- b. Two statements are true.
- c. Three statements are true.
- d. Four statements are true.

Income = 100  
 $P_x = 10$   
 $P_y = 5$

}  $BL: 100 = 10X + 5Y$   
 $20 = 2X + Y$

$\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$  Optimality Condition

$\frac{2Y}{2X} = \frac{10}{5}$

$5Y = 10X$   
 $Y = 2X$

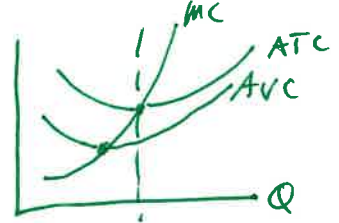
$20 = 2X + 2X$   
 $20 = 4X$   
 $5 = X$   
 $\therefore Y = 10$   
 Optimal Bundle  $(X, Y) = (5, 10)$

SOME WORK

NOT HARD

12. Consider a firm in the short run. You are told that as output increases this firm's marginal cost is greater than its average total cost. Given this information, how many of the following statements are true?

- The firm's average total cost is increasing as output increases. **T**
- The firm's average variable cost is increasing as output increases. **T**
- The firm's fixed cost is increasing as output increases. **False**
- The firm's fixed cost is decreasing as output increases. **False**



Fixed Cost is constant as Q increases

→  $Q \uparrow, MC > ATC$

- a. One statement is true.
- b. Two statements are true.**
- c. Three statements are true.
- d. Four statements are true.

EASY

13. Diminishing returns to labor occurs in the short run when:

- a. output increases at a decreasing rate as an additional unit of labor is hired. ✓**
- b. output increases at an increasing rate as an additional unit of labor is hired. **X**
- c. output stays constant as an additional unit of a labor is hired. **X**
- d. there is too much capital relative to the amount of labor that a firm is hiring. **X**

Little

DEFINITIONAL

14. A public good is non-rival and non-excludable. This means that:

- a. one person's consumption of the good does not impact another person's ability to consume the same good and that it is possible to consume the good even if one does not pay for the good.**
- b. there are no close substitutes for the good (there are no rival goods) and that anyone who wishes to consume the good can consume it (no one is excluded from consuming the good).
- c. one person's consumption of the good does not impact another person's ability to consume the same good since there is no congestion and that everyone must consume this good since it is non-excludable.
- d. if this public good is a roadway that it must be a tollway that is often congested.

public good is an uncongested non-toll road

Use the following information to answer the next two (2) questions.

Consider a firm that can be described by the following equations where  $q$  is the quantity of the product the firm produces:

Total cost for the firm:  $TC = q^2 + 20q + 16$

Marginal cost for the firm:  $MC = 2q + 20$

EASY IF YOU KNOW THE INFO

15. Given this information and holding everything else constant, the firm's minimum average total cost occurs at a quantity equal to:

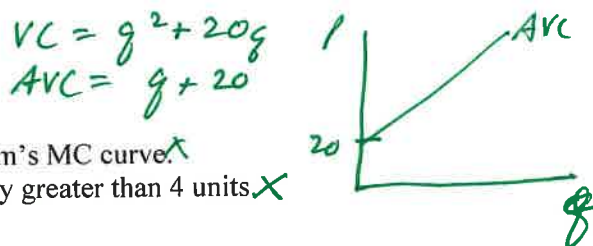
- a. 1 unit
- b. 2 units
- c. 4 units
- d. 16 units

min ATC is where  $ATC = MC$   
 $q + 20 + \frac{16}{q} = 2q + 20$   
 $16 = q^2$   
 $4 = q$

NOT HARD

16. Given the above information and holding everything else constant, the firm's average variable cost curve is:

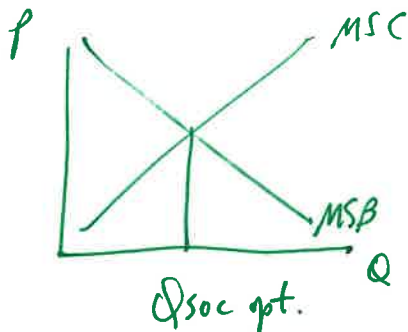
- a. a straight line that has a y-intercept of 20. ✓
- b. a straight line that has a y-intercept of 16. X
- c. a U-shaped curve that has its minimum point intersect the firm's MC curve. X
- d. a U-shaped curve that reaches its minimum point at a quantity greater than 4 units. X



DEFINITION

17. The socially optimal amount of the good to produce is that amount where:

- a. the marginal social benefit from consuming one more unit of the good is greater than the marginal social cost of producing one more unit of the good. X *Should be MSB = MSC*
- b. the marginal social cost of producing one more unit of the good is equal to the price that consumers are willing to pay for the last unit of the good they consume. X *Consumers may not include all benefits*
- c. the marginal social benefit from consuming one more unit of the good is equal to the cost that producers incur when they produce the last unit of the good. X *Producers may not be working at MSC*
- d. the marginal social benefit from consuming one more unit of the good is equal to the marginal social cost of producing one more unit of the good.



Use the following information to answer the next two (2) questions.

A perfectly competitive industry has 10 identical firms. You are provided the following information:

Market Demand:  $P = 100 - 2Q$

Marginal Cost for the representative firm:  $MC = 80q$

Total Cost for the representative firm:  $TC = 40q^2 + 10$

18. Given this information and holding everything else constant, in the short run which of the following statements is true?

- a. In the short run the representative firm will produce two units of the good. ~~X~~  $q=1$
- b. In the short run the equilibrium price in the market will be \$80 per unit. True
- c. In the short run the representative firm will earn negative economic profits. ~~X~~  $\pi = \$30$
- d. The short run average total cost for the representative firm is equal to \$8 per unit of output. ~~X~~ \$50/unit of output

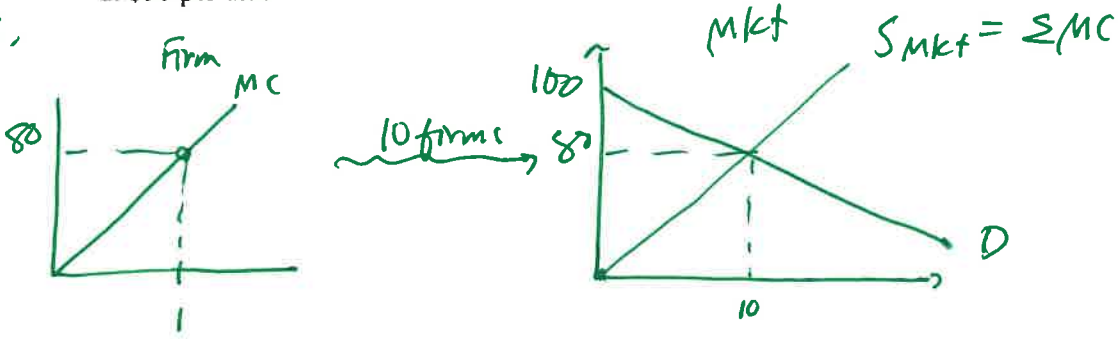
19. Given this information and holding everything else constant, in the long run the breakeven price for a representative firm in this market is equal to:

- a. \$20 per unit
- b. \$30 per unit
- c. \$40 per unit
- d. \$50 per unit

NOT TOO BAD

SOME WORK

18.



Mkt S:  $P = 8Q$   
 $D = S$   
 $100 - 2Q = 8Q$   
 $100 = 10Q$   
 $10 = Q$   
 $P = 80$   
 $q = 1$

SR:  $TR_{firm} = \$80$   
 $TC_{firm} = 40 + 10 = \$50$   
 $\pi_{firm} = \$30 > 0$   
 $ATC = \frac{40}{q} + \frac{10}{q} = 50, \text{ if } q=1$

19.

ATC = MC at breakeven price  
 $40q + \frac{10}{q} = 80q$   
 $40q = \frac{10}{q}$   
 $40q^2 = 10$   
 $q^2 = \frac{10}{40} = \frac{1}{4}$   
 $q = \frac{1}{2}$   
 if  $q = \frac{1}{2} \Rightarrow MC = 80(\frac{1}{2})$   
 $MC = 40 = P$



Use the following information to answer the next **two** questions.

A monopolist has the following cost functions where  $Q$  is the quantity of the good and  $P$  is the price of the good:

$$TC = 100 + 20Q$$

$$\text{Marginal Cost for the Monopolist: } MC = 20$$

The market demand for this good is given by the following equation:

$$Q = 200 - 2P$$

PREDICTABLE

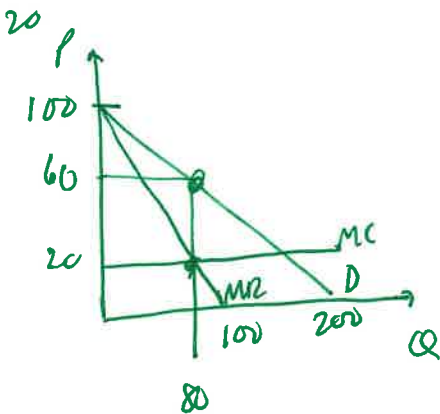
20. What is the price that the monopolist should charge in order to maximize its profits?

- a. \$200 per unit
- b. \$100 per unit
- c. \$20 per unit
- d. \$60 per unit

NOT HARD

21. What are the monopolist's profits and its producer surplus when it produces the profit maximizing level of output?

- a. \$4800; \$4900
- b. \$3100; \$3100
- c. \$3100; \$3200
- d. \$5000; \$5100



$$Q = 200 - 2P$$

$$2P = 200 - Q$$

$$P = 100 - \frac{1}{2}Q$$

$$MR = 100 - Q$$

$$MC = MR$$

$$20 = 100 - Q$$

$$Q = 80$$

$$P = 100 - \frac{1}{2}(80) = 60$$

$$21. \pi = TR - TC$$

$$\pi = 60(80) - [100 + 20(80)]$$

$$\pi = 4800 - [100 + 1600]$$

$$\pi = 4800 - 1700$$

$$\pi = 3100$$

$$PS = (60 - 20)(80)$$

$$PS = (40)(80)$$

$$PS = 3200$$

22. Suppose Joe and Mary want to put on a fireworks show where they will be the only consumers of this show. Mary and Joe's demands for fireworks are given by the following equations where  $P$  is the price per unit of fireworks and  $Q$  is the number of units of fireworks:

Mary's demand for fireworks:  $P = 5 - (1/2)Q$

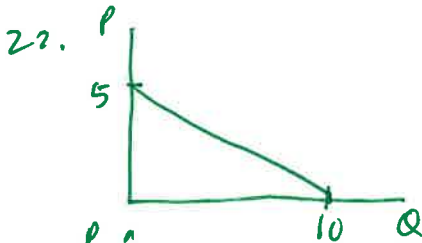
Joe's demand for fireworks:  $P = 10 - Q$

Suppose the marginal social cost of fireworks is \$3 per additional unit of fireworks. Suppose they decide to buy the allocatively efficient amount of fireworks. Given this information and holding everything else constant, how much should Joe contribute per unit of fireworks?

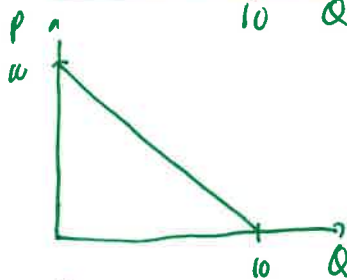
- a. \$1 per unit of fireworks
- b. \$2 per unit of fireworks**
- c. \$3 per unit of fireworks
- d. \$4 per unit of fireworks

23. A natural monopoly is producing an output level of 5,000 units per day. If the monopoly is broken up into 5 equal sized firms, then average total cost for each of the 5 firms:

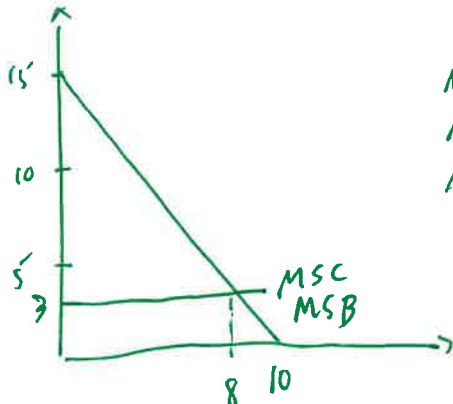
- a. Will exceed the monopolist's average total cost. T**
- b. Will equal the monopolist's average total cost. F
- c. Will fall below the monopolist's average total cost. F
- d. May be higher or lower than the monopolist's average total cost. F



Mary

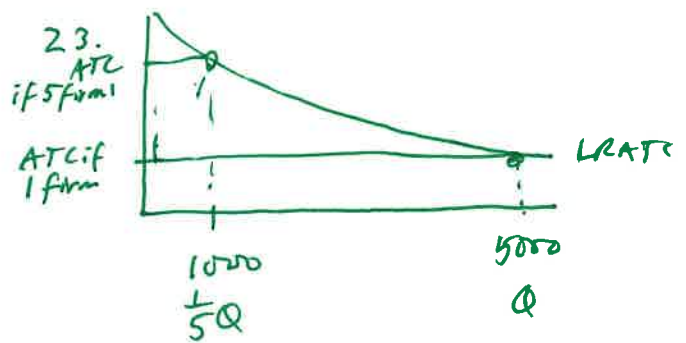


Joe



$$\begin{aligned}
 MSC &= 3 \\
 MSB &= 15 - \frac{15}{10}Q \\
 MSB &= 15 - \frac{3}{2}Q \\
 MSC &= MSB \\
 3 &= 15 - \frac{3}{2}Q \\
 \frac{3}{2}Q &= 12 \\
 Q &= 12 \left( \frac{2}{3} \right) = 8
 \end{aligned}$$

if  $Q = 8 \Rightarrow P_{Joe} = 10 - Q = 2$



24. A firm engages in perfect price discrimination. You are provided the following information about the firm where  $P$  is the price per unit and  $Q$  is the number of units of the good:

SOME WORK

Demand for the firm's product:  $P = 300 - 2Q$   
 Marginal Cost for the firm:  $MC = Q$   
 Fixed Cost for the firm:  $FC = 10$   
 Variable Cost for the firm:  $VC = (1/2)Q^2$

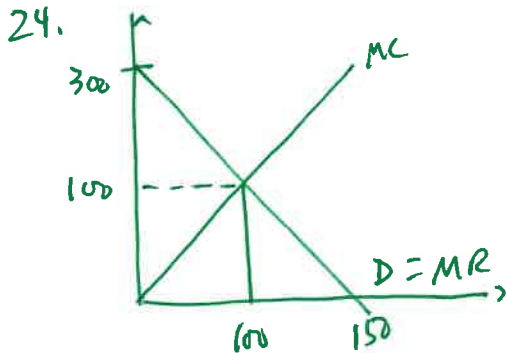
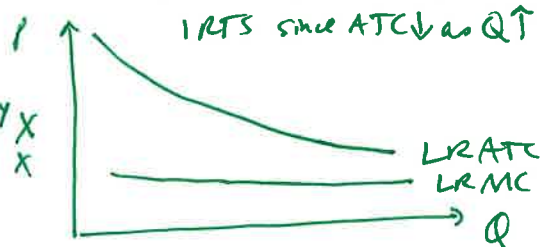
Given this information and holding everything else constant, the firm will produce \_\_\_\_\_ units of the good and the firm's profits will equal \_\_\_\_\_ when the firm practices first degree price discrimination.

- a.  $Q = 100$  units; Profits = \$15,000 ~~X~~
- b.  $Q = 60$  units; Profits = \$12,590 ~~X~~
- c.  $Q = 100$  units; Profits = \$14,990
- d.  $Q = 60$  units; Profits = \$12,600 ~~X~~

25. An electricity producer is producing in the region of increasing returns to scale. Assume that if this producer increases her level of production that they will still be producing in the region of increasing returns to scale. This means that if she increases her output holding everything else constant:

NOT TOO BAD

- a. her average total cost will increase. FALSE <sup>may or may not</sup>
- b. her marginal cost will definitely increase. <sup>not</sup>
- c. her average variable cost will increase. <sup>may or may not</sup>
- d. her average total cost will decrease.



$$MR = MC$$

$$300 - 2Q = Q$$

$$300 = 3Q$$

$$100 = Q \Rightarrow \text{eliminates (b) \& (d)}$$

$$\Pi = TR - TC$$

$$TR = \frac{1}{2}(300 - 100)(100) + 100(100)$$

$$TR = 10,000 + 10,000 = 20,000$$

$$TC = 10 + \frac{1}{2}Q^2 = 10 + \frac{1}{2}(100)(100)$$

$$TC = 10 + 5000 = 5010$$

$$\Pi = 20,000 - 5010 = 14,990$$

26. Consider a firm that can be described as follows where  $P$  is the price per unit of the good and  $Q$  is the number of units of the good:

NOT  
HARD

Demand for the firm's product:  $P = 300 - 2Q$

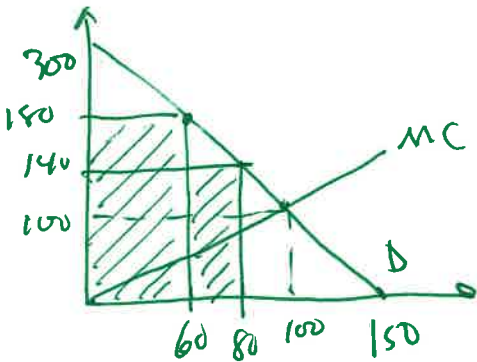
Marginal Cost for the firm:  $MC = Q$

Fixed Cost for the firm:  $FC = 10$

Variable Cost for the firm:  $VC = (1/2)Q^2$

Suppose this firm decides to offer its first 60 units at a price of \$180 per unit and an additional 20 units at a price of \$140. That is, the firm decides to engage in second degree price discrimination. You calculate that the firm's total revenue (TR) with this pricing plan is equal to \_\_\_\_\_ and its total costs (TC) with this pricing plan is equal to \_\_\_\_\_.

- a.  $TR = (180)(60) + (140)(20)$ ;  $TC = 10 + (1/2)(60)(60) + (1/2)(20)(20)$  ✗
- b.  $TR = (180)(60) + (140)(80)$ ;  $TC = (1/2)(80)(80) + 10$  ✗
- c.  $TR = (180)(60) + (140)(80)$ ;  $TC = 10 + (1/2)(60)(60) + (1/2)(20)(20)$  ✗
- d.  $TR = (180)(60) + (140)(20)$ ;  $TC = 10 + (1/2)(80)(80)$  ✓



$TR = 60(180) + 20(140)$   
*eliminates (b) & (c)*  
 $TC = VC + FC$   
 $TC = \frac{1}{2}Q^2 + 10$   
 $TC = \frac{1}{2}(80)(80) + 10$



EXAM CONTINUES!

**Work Sheet: do NOT remove from exam!**

27. Consider a firm that knows that it has two classes of buyers for its product. Furthermore, suppose that the firm can distinguish between Class One buyers and Class Two buyers. You are provided the following information about this firm where P is the price per unit and Q is the number of units of the good:

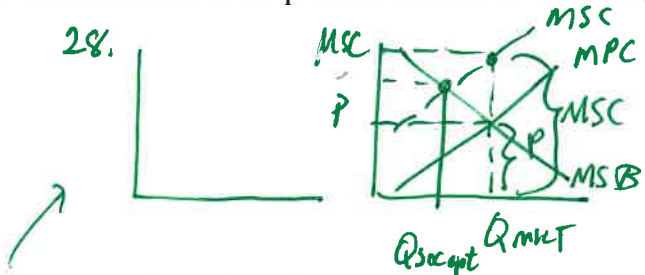
A LOT OF WORK

- Demand for the good from Class One:  $P = 100 - Q$
- Demand for the good from Class Two:  $P = 50 - Q$
- Marginal Cost for the firm:  $MC = 20$
- Fixed Cost for the firm:  $FC = 0$

Given this information and holding everything else constant, how many of the following statements are true when this firm practices third degree price discrimination?

- The firm will sell more units of the good to Class One buyers than to Class Two buyers. **TRUE**
- Class One buyers will pay a higher price than Class Two buyers. **TRUE**
- The profit maximizing quantity of the good for this firm to produce (the total quantity they produce when profit maximizing) will be equal to 55 units of the good. **TRUE**
- When the firm practices third degree price discrimination in this problem it results in there being no deadweight loss. **False**

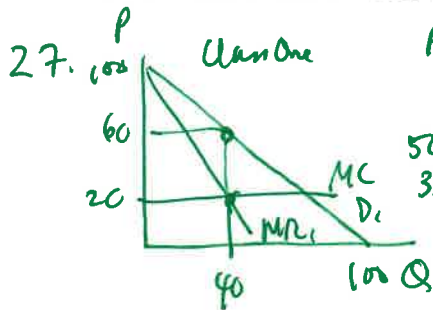
- One statement is true.
- Two statements are true.
- Three statements are true.
- Four statements are true.



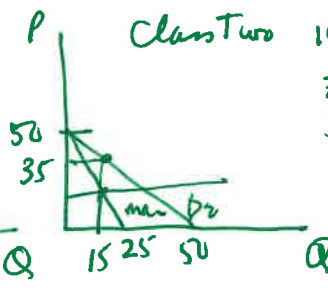
28. Suppose the market for widgets is perfectly competitive. The only way to produce widgets produces a great deal of sulfur pollution (which causes acid rain), and producers do not include these pollution damages in their costs (thus sulfur pollution is a negative externality). Which of the following will hold in the unregulated market outcome? P is the price of the good, MPC is the marginal private cost of producing the good and MSC is the marginal social cost of producing the good.

NOT TOO BAD

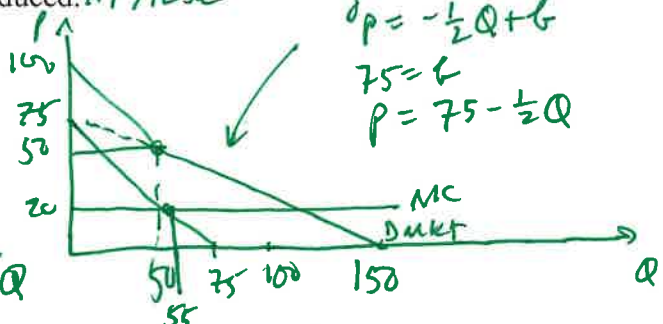
- $P = MPC = MSC$  for the last unit produced. **False**
- $P = MPC$  and  $P < MSC$  for the last unit produced. **TRUE**
- $P = MPC$  and  $P > MSC$  for the last unit produced. **FALSE**
- $P > MPC$  and  $P = MSC$  for the last unit produced. **FALSE**



$$\begin{aligned}
 MC &= 20 \\
 MR &= 100 - 2Q \\
 20 &= 100 - 2Q \\
 2Q &= 80 \\
 Q_1 &= 40 \\
 P_1 &= 60
 \end{aligned}$$



$$\begin{aligned}
 MC &= 20 \\
 MR &= 50 - 2Q \\
 20 &= 50 - 2Q \\
 2Q &= 30 \\
 Q_2 &= 15 \\
 P_2 &= 35
 \end{aligned}$$



$$\begin{aligned}
 MR &= 75 - Q \\
 MR &= MC \\
 75 - Q &= 20 \\
 Q &= 55
 \end{aligned}$$

$$\begin{aligned}
 y &= mx + b \\
 P &= -\frac{1}{2}Q + b \\
 75 &= b \\
 P &= 75 - \frac{1}{2}Q
 \end{aligned}$$

29. Consider Tom and Annie. Annie really wants to watch football, and while Tom would rather be shopping, he would also like to be with Annie. The following gives the matrix form of their payoffs where each number measures the utility that the individual gets from the activity:

NOT  
BAD

|       |                | Tom                |                    |
|-------|----------------|--------------------|--------------------|
|       |                | Watch Football     | Go Shopping        |
| Annie | Watch Football | Annie: 3<br>Tom: 2 | Annie: 3<br>Tom: 1 |
|       | Go Shopping    | Annie: 1<br>Tom: 0 | Annie: 2<br>Tom: 5 |

Given the information above, the equilibrium for this game is:

- Annie watches football, and Tom shops.
- Annie and Tom watch football together.
- Annie shops, and Tom watches football.
- Annie and Tom shop together.

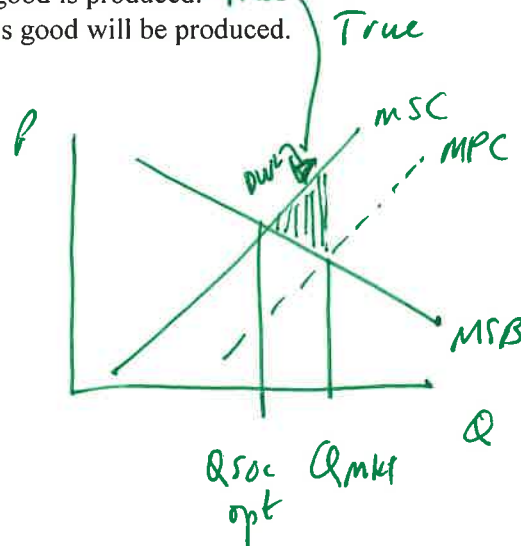
Annie:  $\begin{matrix} \boxed{X} & \boxed{X} \end{matrix}$  Dominant Strategy: Watch Football  
 Tom:  $\begin{matrix} \boxed{X} \\ \boxed{X} \end{matrix}$  No Dominant Strategy. Given that Annie will always choose Watch Football  $\Rightarrow$  so will Tom

EASY

30. Consider an industry that creates pollution when the industry manufactures its product. Suppose the firms in this industry ignore this pollution. How many of the following statements are true given this situation and holding everything else constant?

- The market will produce less than the socially optimal amount of the good. *False*
- The true supply curve that represents the marginal social cost of producing this good will be located to the left of the marginal private cost curve of producing this good. *True*
- There will be a deadweight loss when this good is produced. *True*
- From a societal perspective too much of this good will be produced. *True*

- One statement is true.
- Two statements are true.
- Three statements are true.
- Four statements are true.



### III. Problems (2 questions worth 10 points each)

1. You are given the following information about a perfectly competitive industry where  $q$  is the quantity produced by the firm,  $Q$  is the market quantity, and  $P$  is the market price.

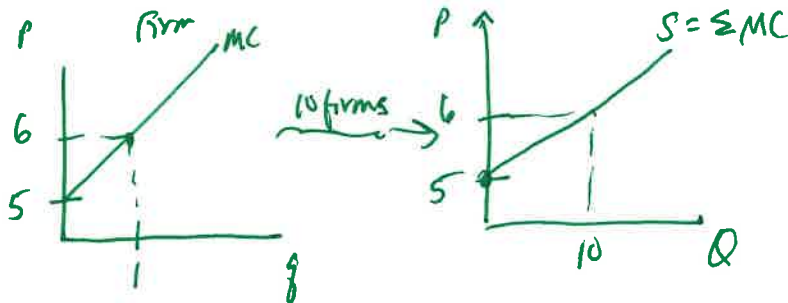
Number of firms in the industry: ten firms

Marginal cost for the representative firm:  $MC = 5 + q$

Total cost for the representative firm:  $TC = 5q + (1/2)q^2 + 12.5$

Market Demand for the good:  $P = 40 - (2/15)Q$

a. (2 points) Given this information and holding everything else constant, write an equation for the market supply curve in y-intercept form. Show your work.



Market Supply:

$$P = 5 + \frac{1}{10}Q$$

Algebra:

$$P = 5 + q$$

$$q = P - 5$$

$$q_1 + q_2 + \dots + q_{10} = 10(P - 5)$$

$$Q_T = 10P - 50 \text{ or } P = \frac{1}{10}Q + 5$$

b. (2 points) Given this information and holding everything else constant, what is the short run equilibrium price and equilibrium quantity in this market? Show your work to get full credit.

SR Price:  $D = S$

$$40 - \left(\frac{2}{15}\right)Q = 5 + \frac{1}{10}Q$$

$$35 = \left(\frac{4}{30}\right)Q + \left(\frac{3}{30}\right)Q$$

$$35 = \left(\frac{7}{30}\right)Q$$

$$Q = \left(\frac{35}{\frac{7}{30}}\right) = 150$$

$$P = 5 + \frac{1}{10}Q = 5 + \frac{1}{10}(150) = 20$$

$$Q_{SR} = 150 \text{ units}$$

$$P_{SR} = \$20/\text{unit}$$

c. (2 points) Given this information and holding everything else constant, what is the equation for this firm's average variable cost?

$$VC = 5q + \left(\frac{1}{2}\right)q^2$$

$$AVC = \frac{VC}{q} = 5 + \left(\frac{1}{2}\right)q$$



d. (2 points) Given this information and holding everything else constant, what are the short-run profits for the representative firm? Show your work to get full credit.

$$\begin{aligned} \Pi &= TR - TC && \text{if } P = 20 \Rightarrow q = ? \\ & && MR = MC \\ & && 20 = 5 + q \\ & && 15 = q \\ \Pi &= P \cdot q - \left[ 5q + \frac{1}{2}q^2 + 12.5 \right] \\ \Pi &= 20(15) - \left[ 5(15) + \frac{1}{2}(15)(15) + 12.5 \right] \\ \Pi &= 300 - \left[ 75 + \frac{1}{2}(225) + 12.5 \right] \\ \Pi &= 300 - \left[ 75 + 112.5 + 12.5 \right] \\ \Pi &= 300 - \left[ 75 + 125 \right] = \$100 \end{aligned}$$

$\Pi_{SR} = \$100$

e. (2 points) How many firms will be in this industry in the long run? Show your work to get full credit.

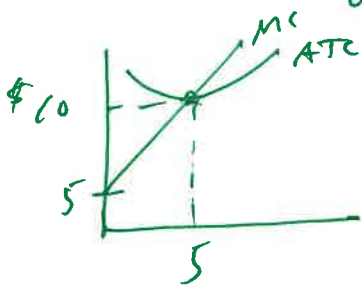
LR  $MR = ATC$  at breakeven pt.

$$5 + q = 5 + \frac{1}{2}q + \frac{12.5}{q}$$

$$\frac{1}{2}q = \frac{12.5}{q}$$

$$q^2 = 25$$

$$q_{LR} = 5$$



$$\text{if } q = 5 \Rightarrow P = 5 + q$$

$$P = 10$$

if  $P = \$10$  at breakeven pt

$$P = 40 - \left(\frac{2}{15}\right)Q$$

$$10 = 40 - \left(\frac{2}{15}\right)Q$$

$$\frac{2}{15}Q = 30$$

$$Q_{LR} = \frac{30(15)}{2} = 225$$

$$\# \text{ of firms}_{LR} = \frac{Q_{LR}}{q_{LR}} = \frac{225}{5} = \boxed{45 \text{ firms}}$$

2. Consider a monopoly that can be described by the following information where  $Q$  is the market quantity and  $P$  is the market price:

Market Demand for the Good:  $P = 125 - 2Q$

Marginal Cost curve for the Monopolist:  $MC = 25 + Q$

Total Cost for the Monopolist:  $TC = 25Q + (1/2)Q^2 + 20$

a. (2 points) Given the above information and holding everything else constant, you are asked to determine what this monopolist's average fixed cost (AFC) is when it produces two units of the good. Show your work to get full credit. Make sure your answer includes the units of measurement to get full credit!

$FC = 20$

$AFC = \frac{20}{Q}$

if  $Q = 2$

$AFC = \frac{20}{2} = \$10/\text{unit of output}$

b. (2 points) Given the above information and holding everything else constant, write the equation for this monopolist's marginal revenue (MR) curve.

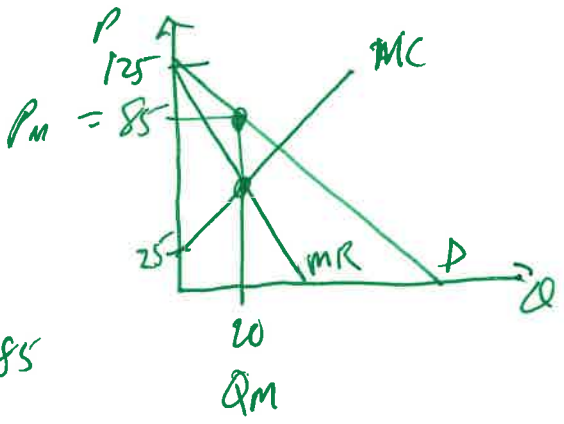
$MR = 125 - 4Q$

c. (2 points) Given the above information and holding everything else constant, what is the level of output and the price that this monopolist will choose if they are a single price monopolist that is maximizing their profit? Show your work to get full credit.

$MR = MC$   
 $125 - 4Q = 25 + Q$   
 $100 = 5Q$   
 $20 = Q_M$

$P = 125 - 2Q$   
 $P = 125 - 2(20) = \$85$

$Q_M = 20$   
 $P_M = \$85$



d. (2 points) Given the above information and holding everything else constant, calculate this monopolist's profits. Show your work and make sure it is clear how you got your answer!

$$\begin{aligned} \pi &= TR - TC \\ \pi &= 85(20) - [25Q + (\frac{1}{2})Q^2 + 20] \\ \pi &= 1700 - [25(20) + (\frac{1}{2})(20)(20) + 20] \\ \pi &= 1700 - [500 + 200 + 20] \\ \pi &= 1700 - 720 = \$980 \end{aligned}$$

$$\begin{array}{r} 1700 \\ - 720 \\ \hline 980 \end{array}$$

e. (2 points) What is a barrier to entry? Give two examples of an effective barrier to entry.

Natural barriers to entry } A barrier to entry is something  
 Created barriers to entry } that effectively keeps  
 firms from entering an  
 industry

Natural barriers to entry

- 1) Economies of scale
- 2) Control of essential resource

Created barriers to entry

- 1) Patent Protection - Copyright, trademark
- 2) Licensing or chartering
- 3) Threat of force or sabotage

**END OF EXAM! THANK YOU!**