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## Final Exam

You have until 1:50pm to complete this exam. Be certain to put your name, id number and section on both the exam and your scantron sheet and fill in test form A on the scantron. Answer all multiple choice questions on your scantron sheet. Choose the single best answer for each question; if you fill in multiple answers for a question you will be marked wrong. Answer the long answer questions directly on the exam. You must show your work for full credit. Answers may be left as fractions. Please place a box around final answers when appropriate. Good luck!

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**Name:**

**ID Number:**

**Section:**

### SECTION I: MULTIPLE CHOICE (60 points)

1. A firm with smooth, convex isoquants and a diminishing technical rate of substitution is currently minimizing costs by using 10 units of capital and 10 units of labor. If the rental rate of capital increases and the firm wants to keep producing the same amount of output, it will:
  - (a) Switch to using more than 10 units of labor and more than 10 units of capital.
  - (b) Switch to using less than 10 units of labor and more than 10 units of capital.
  - (c) Switch to using more than 10 units of labor and less than 10 units of capital.
  - (d) Switch to using less than 10 units of labor and less than 10 units of capital.
2. Bundles on the same indifference curve:
  - (a) Will give a consumer the same level of utility but may cost different amounts.
  - (b) Will cost a consumer the same amount but may give the consumer different levels of utility.
  - (c) Will be preferred to bundles lying above the indifference curve if preferences are monotonic.
  - (d) None of the above.
3. If average variable costs are rising as output increases, which of the following must be true?
  - (a) Average costs are rising as output increases.
  - (b) Marginal costs are above average costs.
  - (c) Marginal costs are above average variable costs.
  - (d) Average costs are falling as output increases.
4. The demand curve for an ordinary good:
  - (a) Will be upward sloping.
  - (b) Will be downward sloping.
  - (c) Will be downward sloping only if the good is normal.
  - (d) Will be downward sloping only if the good is inferior.

5. Suppose the government forces a monopoly to produce at the efficient quantity but lets them set whatever price they want. Which of the following is definitely true?
  - (a) The monopoly will earn zero profits.
  - (b) The monopoly will still earn positive profits.
  - (c) The monopoly will earn negative profits.
  - (d) Total surplus will be maximized.
6. New health benefits are discovered for cranberry juice, shifting the demand curve for cranberry juice to the right. If the market for cranberry juice is perfectly competitive, then in the short run \_\_\_\_\_ and in the long run \_\_\_\_\_. (Assume all firms have identical, upward sloping marginal cost curves.)
  - (a) The price of cranberry juice will rise; the number of firms will increase and price will return to its original level.
  - (b) The price of cranberry juice will rise; the number of firms will decrease and price will return to its original level.
  - (c) Firm profits will stay constant; firm profits will increase.
  - (d) Firm profits will increase; the price of cranberry juice will increase.
7. After a price change, the substitution effect will be positive for the good that:
  - (a) Became relatively cheaper.
  - (b) Became relatively more expensive.
  - (c) It depends on whether the good is ordinary or Giffen.
  - (d) It depends on whether the good is normal or inferior.
8. In which scenario is a monopoly most likely to occur?
  - (a) An industry where minimum efficient scale is very small relative to demand.
  - (b) An industry where minimum efficient scale is very large relative to demand.
  - (c) An industry where there are low average costs at all levels of output and no barriers to entry.
  - (d) An industry where there are constant average costs and no barriers to entry.
9. If a competitive firm is maximizing profits in the short run, which of the following is definitely true?
  - (a) The firm is producing at a quantity  $y$  where  $p = MC(y)$ .
  - (b) The firm is earning profits greater than or equal to zero.
  - (c) The firm's producer surplus must be greater than or equal to zero.
  - (d) The firm's average costs will be lower than the price of output.
10. In the short run, capital is a fixed input and labor is a variable input and has a diminishing marginal product. Which of the following would definitely not lead to an increase in output in the short run? (Assume firms always maximize profits in the short run.)
  - (a) An increase in the price of output and an increase in the wage.
  - (b) An increase in the price of output and a decrease in the wage.
  - (c) A decrease in the price of output and an increase in the wage.
  - (d) A decrease in the price of output and a decrease in the wage.

11. Suppose that there are two types of firms producing toy cars. One type of firm has costs given by  $C(y) = 8y$ . The other type of firm has costs given by  $C(y) = 10y$ . If firms of both types can freely enter and leave the market, what will the long run price of toy cars be? (Assume that the demand curve is linear and downward sloping.)
- (a) It depends on the slope of the demand curve.
  - (b) It depends on the number of firms.
  - (c) \$8.
  - (d) \$10.
12. On a graph with cookies on the horizontal axis and milk on the vertical axis, the \_\_\_\_\_ the marginal utility of milk is, the \_\_\_\_\_ the indifference curves will be.
- (a) Larger, steeper.
  - (b) Larger, flatter.
  - (c) The slope of the indifference curve does not depend on the marginal utility of milk.
  - (d) None of the above.
13. Suppose that metal and wood are the only inputs used by a firm, the firm has a diminishing technical rate of substitution, metal costs twice as much as wood and the marginal product of wood is twice as much as the marginal product of metal at the current levels of inputs. The firm can keep output the same and lower costs by:
- (a) Increasing the amount of wood used and decreasing the amount of metal used.
  - (b) Increasing the amount of metal used and decreasing the amount of wood used.
  - (c) Increasing both the amount of metal used and the amount of wood used.
  - (d) Decreasing both the amount of metal used and the amount of wood used.
14. Which of the following statements is true about the monopoly outcome relative to the perfectly competitive market outcome? (Assume demand is a downward sloping line and the firm's marginal cost curve is upward sloping.)
- (a) The monopoly generates a deadweight loss equal to the decrease in consumer surplus.
  - (b) The monopoly generates a deadweight loss less than the decrease in consumer surplus.
  - (c) The monopoly generates a deadweight loss greater than the decrease in consumer surplus.
  - (d) The monopoly does not generate a deadweight loss relative to the competitive outcome.
15. For a competitive firm, \_\_\_\_\_ while for a monopoly \_\_\_\_\_. (Assume market demand is a downward sloping line.)
- (a) Marginal revenue increases as output increases; marginal revenue decreases as output increases.
  - (b) Marginal revenue decreases as output increases; marginal revenue increases as output increases.
  - (c) Marginal revenue stays constant as output increases; marginal revenue increases as output increases.
  - (d) Marginal revenue stays constant as output increases; marginal revenue decreases as output increases.

16. If a \$1 quantity tax is placed on consumers, the overall price paid by consumers rises by 75 cents. If the same tax was placed on producers rather than consumers (assume we are focusing on the short run):
- (a) The net price received by producers would go up by 75 cents.
  - (b) The net price received by producers would go up by 25 cents.
  - (c) The net price received by producers would go down by 75 cents.
  - (d) The net price received by producers would go down by 25 cents.
17. If capital and labor are a firm's only inputs and capital is fixed in the short run, which of the following will be true at the short run profit-maximizing level of labor? (Assume the profit-maximizing level of labor is positive.)
- (a) The marginal product of labor will be equal to the price of output.
  - (b) The marginal product of labor is equal to the wage.
  - (c) The marginal product of labor is equal to wage divided by the rental rate of capital.
  - (d) The marginal product of labor is equal to wage divided by the price of output.
18. For an ordinary but inferior good:
- (a) The Engel curve is upward sloping and the demand curve is downward sloping.
  - (b) The Engel curve is upward sloping and the demand curve is upward sloping.
  - (c) The Engel curve is downward sloping and the demand curve is downward sloping.
  - (d) The Engel curve is downward sloping and the demand curve is upward sloping.
19. In a competitive market, the long run supply curve is:
- (a) Perfectly inelastic.
  - (b) Perfectly elastic.
  - (c) Unit elastic.
  - (d) None of the above.
20. If a firm uses a technology that exhibits increasing returns to scale, doubling the level of output will:
- (a) Double total costs.
  - (b) More than double total costs.
  - (c) Less than double total costs.
  - (d) Lower total costs.

## SECTION II: SHORT ANSWER (40 points)

1. (16 points) Suppose that the market for toys is perfectly competitive and that all toy manufacturers have identical cost functions with the following features: marginal costs for a single manufacturer are given by  $MC(y) = \frac{1}{10}y$ , the minimum of the average cost curve is \$2 and occurs at a quantity of 20 toys. Market demand for toys is given by:

$$D(p) = 1000 - 100p \quad (1)$$

- (a) Suppose that in the short run, there are ten firms. Graph the short run industry supply curve and the demand curve (with price on the vertical axis and quantity on the horizontal axis). Find the equilibrium price and quantity in the short run and label these values on your graph.
- (b) Are firm profits positive or negative in the short run? Be certain to explain your answer. (Note: You may not be able to calculate the exact value of profits but you do have enough information to know the sign of the profits.)
- (c) Based on your answer in (b), what will happen to the number of firms in the industry? Can you say how many firms there will be in the long run? If so, find the number of firms. If not, explain what additional information you would need.
- (d) Suppose that a quantity tax is placed on consumers. Use another graph that includes the demand curve, the short run industry supply curve you found in part (a) and the long run industry supply curve to show the effect of the tax on the price received by manufacturers in the short run and in the long run. Label your graph clearly and include a written explanation of the changes shown on the graph. Be as specific as possible.

2. (10 points) A firm uses flour ( $F$ ) and eggs ( $E$ ) to make pasta. The price of flour is \$2 per unit and the price of eggs is \$4 per unit. The production function for the firm is given by:

$$f(F, E) = F^{\frac{1}{2}} E^{\frac{1}{2}} \quad (2)$$

- (a) Derive expressions for the marginal product of eggs, the marginal product of flour and the technical rate of substitution.
- (b) Derive an expression for the optimal number of eggs to use in terms of the amount of output ( $y$ ). Also derive an expression for the optimal amount of flour to use in terms of the amount of output ( $y$ ).
- (c) Use your answers from part (b) to write total costs as a function of output ( $y$ ).

3. (14 points) There is only one ice cream shop in town. Each additional bowl of ice cream costs the ice cream shop \$4 no matter how many bowls they have already sold and the shop has no fixed costs. The demand for ice cream is given by:

$$D(p) = 50 - \frac{1}{2}p \quad (3)$$

- (a) Write down an expression for the costs of the ice cream shop in terms of the number of bowls of ice cream they sell and another expression for the revenues of the ice cream shop in terms of the number of bowls of ice cream they sell.
- (b) What price will the ice cream shop charge and how many bowls of ice cream will be sold? What are the shop's profits? (Note: Do not worry if prices or quantities seem unrealistic.)
- (c) What is the socially efficient amount of ice cream?
- (d) How much deadweight loss is generated by the ice cream shop acting as a monopoly? Use a graph to show the equilibrium price and quantity, the socially efficient quantity, the deadweight loss, and the profits for the ice cream shop.