

For each question, "E) NOTA" indicates that none of the above answers is correct.

For questions 1 through 13: Consider a market with a single firm. We will try to help that firm maximize its profits. The firm produces $Q = F(L,K) = \sqrt{LK}$ units, where L is labor and K is capital. Each unit of L costs w , and each unit of K costs r , so the firm's total cost $TC = wL + rK$. For this firm, $r = 1$ and $w = 2$. The quantity of the firm's good demanded by consumers as a function of price is given by $Q(p) = 10 - p$.

1. A firm's returns to scale is defined as follows:

Constant returns to scale if (for any constant a greater than 1) $F(aK,aL) = aF(K,L)$

Increasing returns to scale if (for any constant a greater than 1) $F(aK,aL) > aF(K,L)$

Decreasing returns to scale if (for any constant a greater than 1) $F(aK,aL) < aF(K,L)$

Does our firm have constant, increasing, or decreasing returns to scale?

A) Constant B) Increasing C) Decreasing D) Not enough info E) NOTA

The first step to maximizing profits is to minimize the firm's total cost TC at a given output Q.

2. Write K in terms of Q and L, then plug into TC. What is TC in terms of r, w, Q, and L?

A) $rL + wQ^2/L$ B) $wL + rQ^2/L$
 C) $w/L + rQ^2$ D) $r/L + wQ^2$ E) NOTA

3. What value of L, in terms of Q, r, and w, gives the minimized TC?

A) $Q\sqrt{\frac{r}{w}}$ B) $Q\sqrt{\frac{w}{r}}$ C) $\sqrt{\frac{rQ}{w}}$ D) $Q\sqrt{rw}$ E) NOTA

4. What value of K, in terms of Q, r, and w, gives the minimized TC?

A) $Q\sqrt{\frac{r}{w}}$ B) $Q\sqrt{\frac{w}{r}}$ C) $\sqrt{\frac{rQ}{w}}$ D) $Q\sqrt{rw}$ E) NOTA

5. What is TC in terms of Q, r, and w at the minimized TC?

A) $2Q\sqrt{rw}$ B) $Q\sqrt{rw}$ C) $2\sqrt{Qrw}$ D) $\sqrt{2Qrw}$ E) NOTA

6. Marginal cost (MC) is the rate at which TC changes with respect to output Q. What is the firm's marginal cost in terms of Q, r, and w for the minimized TC?

- A) $\sqrt{2rw}$ B) $Q\sqrt{rw}$ C) $2\sqrt{rw}$ D) $2Q\sqrt{rw}$ E) NOTA

7. Recall the demand function $Q(p) = 10 - p$. Find the inverse demand function $p(Q)$.

- A) $p(Q) = 10 - 2Q$ B) $p(Q) = Q - 10$ C) $p(Q) = 10 - Q$ D) $p(Q) = Q + 10$ E) NOTA

8. The firm's total revenue TR is the price of the good times the number of goods they sell. What is the firm's TR in terms of Q?

- A) $10Q - 2Q^2$ B) $Q^2 - 10Q$ C) $10Q + Q^2$ D) $10Q - Q^2$ E) NOTA

9. Marginal revenue (MR) is the rate of change of TR with respect to Q. What is the firm's MR in terms of Q?

- A) $10 - 4Q$ B) $2Q - 10$ C) $10 + 2Q$ D) $10 - 2Q$ E) NOTA

10. Profit P is total revenue minus total cost. What condition must be satisfied in order to maximize profits?

- A) $MC + MR = 0$ B) $MC = MR$ C) $TR = TC$ D) $TR = 2TC$ E) NOTA

11. What is the firm's profit maximizing output Q in terms of r and w? Assume r and w are both less than 3.

- A) $10 - \sqrt{rw}$ B) $5 - \sqrt{rw}$ C) $\sqrt{rw} - 5$ D) $\sqrt{rw} + 5$ E) NOTA

12. What is the firm's profit maximizing price p?

- A) $10 + \sqrt{rw}$ B) $5 + \sqrt{rw}$ C) $5 - \sqrt{rw}$ D) $10 - \sqrt{rw}$ E) NOTA

13. What is the firm's maximum profit P?

- A) $25 + rw - 10\sqrt{rw}$ B) $25 + rw + 10\sqrt{rw}$
C) $100 + rw - 20\sqrt{rw}$ D) $100 + rw + 20\sqrt{rw}$ E) NOTA

For problems 14 – 16, let's consider a market with two firms, F_1 and F_2 . F_1 's costs C_1 as a function of output Q_1 are $C_1(Q_1) = (Q_1)^2$. F_2 's costs as a function of output Q_2 are $C_2(Q_2) = 12Q_2$. Denoting total output produced in the industry by $Q = (Q_1 + Q_2)$, the inverse demand function for the good produced in the industry is given by: $p(Q) = 100 - Q$. Assume both firms pursue strategies that maximize their profits. You will be finding what is called a Cournot-Nash equilibrium. Hint: start by finding each firm's MC and MR functions. You will have to solve a system of equations.

14. What will F_1 's output Q_1 be to achieve the desired result?

- A) 24 B) 36 C) 16 D) 10 E) NOTA

15. What will F_2 's output Q_2 be to achieve the desired result?

- A) 36 B) 24 C) 16 D) 20 E) NOTA

16. What will the equilibrium price be?

- A) 52 B) 48 C) 68 D) 44 E) NOTA

For problems 17-21, consider the following setting:

The market for high definition television sets (HDTV's) in the U.S. can be expressed by the following demand and supply equations:

$$\begin{aligned}Q_D &= 7500 - 2400P \\Q_S &= 600P\end{aligned}$$

Where Q is the number of HDTV's, and P is the price in thousands of dollars.

17. Calculate the equilibrium price and quantity that will prevail in a free market.

- A) $P=2500, Q=2500$ B) $P=2.5, Q=1500$ C) $P=1500, Q=1500$ D) $P=1.5, Q=2500$ E) NOTA

18. Calculate the price elasticity of supply at the equilibrium.

- A) 1 B) -1 C) 4 D) -4 E) NOTA

19. Calculate the consumer surplus at the equilibrium.

- A) 46875000 B) 187500000 C) 187500 D) 93750000 E) NOTA

20. Suppose that the U.S. government provides a subsidy of \$300 per television in an effort to accelerate the adoption of HDTV. What will be the new equilibrium quantity bought?

- A) 2440 B) 2740 C) 814.4 D) 1644 E) NOTA

21. Is there a net welfare loss or gain to society under the subsidy program?

- A) Loss B) Gain C) Not Enough Info D) No loss or gain E) NOTA

22. If the consumer price index changes from 120 to 125 between December 2007 and December 2008, the inflation rate for 2008 is: (round to the nearest tenth)

- A) 4.2% B) 5% C) -4.2% D) -5% E) NOTA

For Questions 23-26, decide if the statement is true, uncertain, or false.

23. The demand for durable goods is more elastic in the long run because even if prices decrease, consumers may not have enough money to buy the goods immediately.

- A) True B) Uncertain C) False

24. Some consumers strongly prefer all types of Pepsi and some strongly prefer all types of Coke. Considering all forms of colas, there is a single market for colas.

- A) True B) Uncertain C) False

25. A window manufacturer operates in a competitive market, where the price of a window is \$50. The firm has two plants, one in Pittsburgh, the other in Boston. For each output level, the Boston plant has lower marginal costs (e.g. the marginal cost of the first unit in Boston is \$10 and it is \$15 in Pittsburgh, while the marginal cost of the 100th unit is \$30 in Boston and \$40 in Pittsburgh). Given these lower costs, the firm should only produce in Boston.

- A) True B) Uncertain C) False

26. A firm with seller market power will never choose a level of output (and price) that yields negative marginal revenue in any period, even in the presence of positive network externalities for its product.

- A) True B) Uncertain C) False

27. Suppose a bank receives a \$5,000 deposit, and the reserve ratio is 25%. The bank is required to keep in reserve an amount equal to:

- A) 1250 B) 1000 C) 200 D) 500 E) NOTA

28. If the slope of the aggregate expenditures curve = 0.8, the multiplier is equal to:

- A) 1.8 B) 4 C) 5 D) 2 E) NOTA

29. Suppose your firm is thinking about producing televisions next period. The price of a TV is \$100 and the marginal cost is \$80 for each TV produced up to a capacity of 10,000 units. However, in order to produce next period, a fixed development cost of \$185,000 must be paid this period. With a discount rate of 0.05 should you take on the project (will you earn money)?

- A) Yes B) No C) Not Enough Info

30. Which of the following combinations of unemployment and inflation could lie on the same long-run Phillips curve?

Combination	Unemployment rate	Inflation rate
W	5%	3%
X	4%	5%
Y	5%	5%
Z	6%	3%
Table: Combinations of Unemployment and Inflation		

- A) W and Z B) W and Y C) X and Z D) W and X E) NOTA