

## 2017 AP<sup>®</sup> MICROECONOMICS FREE-RESPONSE QUESTIONS

### MICROECONOMICS

#### Section II

Total Time—60 minutes

Reading Period—10 minutes

Writing Period—50 minutes

**Directions:** You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.
  - (a) Draw correctly labeled side-by-side graphs for the corn market and a representative corn farmer. On your graphs show each of the following.
    - (i) The equilibrium price and quantity in the corn market, labeled  $P_M$  and  $Q_M$ , respectively
    - (ii) The profit-maximizing quantity of corn produced by the representative farmer earning zero economic profit, labeled  $Q_F$
  - (b) Assume the demand for ethanol increases. On your graphs in part (a) show what will happen to each of the following in the short run.
    - (i) The market price and quantity of corn, labeled  $P^*$  and  $Q^*$
    - (ii) The area of the profit or loss earned by the representative corn farmer, shaded completely
  - (c) Relative to your answer in part (b), state what will happen to the market equilibrium price and quantity of corn in the long run. Explain.
  - (d) Soybeans are produced in a perfectly competitive market. Assume farmers can grow either corn or soybeans on the same land. What happens to the price of soybeans in the next planting season if the price of corn increases? Explain.
  - (e) Assume instead that the government sets a binding price ceiling in the corn market. Draw a new correctly labeled graph for the corn market and show each of the following.
    - (i) The binding price ceiling, labeled  $P_c$
    - (ii) The quantity purchased by consumers in the corn market, labeled  $Q_p$

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2. The table below shows the output a firm produces using different amounts of capital (K) and labor (L). The markets for capital and labor are perfectly competitive. The rental rate of capital is \$75 per unit, and the wage rate is \$200 per unit. In the short run, capital is fixed and labor is variable.

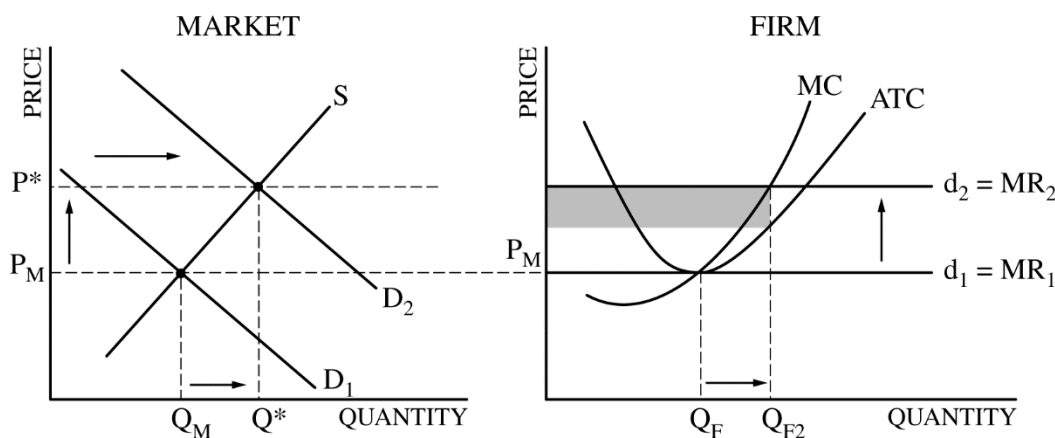
Labor	Output with K=1	Output with K=2
0	0	0
1	10	20
2	25	50
3	38	75

- (a) If the firm uses one unit of capital and one unit of labor, will it be operating with constant, increasing, or decreasing returns to scale? Explain using numbers from the table.
- (b) Assume now that the firm currently has two units of capital and is using three units of labor.
- Calculate the marginal product for the third unit of labor. Show your work.
  - Did the firm experience diminishing marginal returns with the addition of the third unit of labor? Explain using numbers from the table.
  - Calculate the firm's average total cost for its current level of production. Show your work.
  - If the firm's output is sold in a competitive market, what is the lowest output price at which the third unit of labor would be hired?

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## Question 1

**10 points** (4 + 2 + 1 + 1 + 2)



(a) 4 points:

- One point is earned for drawing a correctly labeled graph of the corn market with  $P_M$  and  $Q_M$ . The market demand curve must be downward sloping and the market supply curve must be upward sloping.
- One point is earned for showing a horizontal demand curve on the firm's graph extended from the market equilibrium price,  $P_M$ .
- One point is earned for identifying the firm's profit-maximizing quantity,  $Q_F$ , at marginal cost equal to marginal revenue ( $MC=MR_1$ ).
- One point is earned for showing the firm's average total cost (ATC) curve and marginal cost (MC) passing through the minimum point of ATC, and  $P = ATC = MC$  at  $Q_F$ .

**Note:** All quantities and prices should be labeled on the axes and connected to the intersection points by dashed lines.

(b) 2 points:

- One point is earned for showing a rightward shift of the market demand curve and a higher price and quantity,  $P^*$  and  $Q^*$ .
- One point is earned for completely shading the area representing the profit for a representative corn farmer.

(c) 1 point:

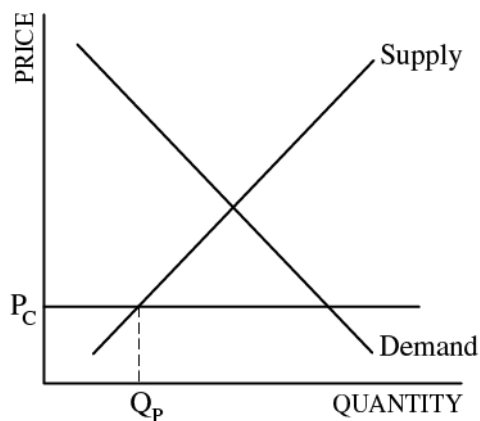
- One point is earned for stating that the market quantity will increase and the market's price will decrease in the long run, and for explaining that new corn farmers will enter the market, which will increase the market supply curve.

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**Question 1 (continued)**

(d) 1 point:

- One point is earned for stating that the price of soybeans in the next planting season will increase, and for explaining that the supply of soybeans will decrease because the higher price of corn encourages farmers to substitute corn for soybeans in production.



(e) 2 points:

- One point is earned for showing a correctly labeled graph of the corn market, with the price ceiling,  $P_C$ , below the equilibrium price of corn.
- One point is earned for showing the quantity purchased by consumers in the corn market labeled as  $Q_P$  where  $P_C$  intersects the supply curve.