MICROECONOMICS
Section II
Planning time—10 minutes
Writing time—50 minutes

Directions: You have 50 minutes to answer all three of the following questions. 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. In answering the questions, you should emphasize the line of reasoning that generated your results; it is not enough to list the results of your analysis. 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. Assume that corn is produced in a perfectly competitive market. Farmer Roy is a typical producer of corn.

   (a) Assume that Farmer Roy is making zero economic profit in the short run. Draw a correctly labeled side-by-side graph for the corn market and for Farmer Roy and show each of the following.

      (i) The equilibrium price and quantity for the corn market, labeled as P_{M1} and Q_{M1}, respectively

      (ii) The equilibrium quantity for Farmer Roy, labeled as Q_{F1}

   (b) For Farmer Roy's corn, is the demand perfectly elastic, perfectly inelastic, relatively elastic, relatively inelastic, or unit elastic? Explain.

   (c) Corn can be used as an input in the production of ethanol. The demand for ethanol has significantly increased.

      (i) Show on your graph in part (a) the effect of the increase in demand for ethanol on the market price and quantity of corn in the short run, labeling the new equilibrium price and quantity as P_{M2} and Q_{M2}, respectively.

      (ii) Show on your graph in part (a) the effect of the increase in demand for ethanol on Farmer Roy's quantity of corn in the short run, labeling the quantity as Q_{F2}.

      (iii) How does the average total cost for Farmer Roy at Q_{F2} compare with P_{M2}?

   (d) Corn is also used as an input in the production of cereal. What is the effect of the increased demand for ethanol on the equilibrium price and quantity in the cereal market in the short run? Explain.

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2. The John Lamb Company, a profit-maximizing firm producing widgets, is in a perfectly competitive widget market. Assume John Lamb employs a fixed number of employees and rents a machine for a variable number of hours from a perfectly competitive market.

   (a) Using correctly labeled side-by-side graphs of the factor market for machines and the John Lamb Company, show each of the following.

      (i) The equilibrium rental price of machines in the factor market, labeled as P_R

      (ii) John Lamb's equilibrium rental quantity of machines, labeled as Q_L

   (b) Assume that the popularity of widgets declines, decreasing the demand for widgets. What will happen to each of the following?

      (i) Marginal product curve for machine-hours

      (ii) Marginal revenue product curve for machine-hours. Explain.

   (c) John Lamb is employing the cost-minimizing combination of inputs. The marginal product of labor is 28 widgets per worker hour and the wage rate is $14 per hour. The marginal product of the machine is 60 widgets per machine-hour. What is the hourly rental price of a machine?

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10 points (4+1+4+1)
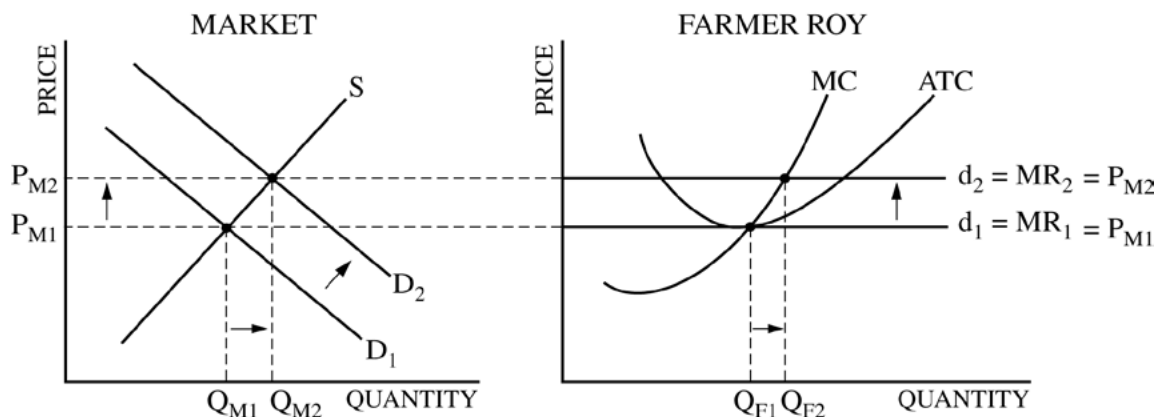
(a)   4 points:
- One point is earned for a correctly labeled graph of the corn market (S, D, P_{M1}, Q_{M1}).
- One point is earned for the graph of the firm with a horizontal demand curve at P_{M1}.
- One point is earned for showing the profit-maximizing quantity, Q_{F1}, at MC = MR.
- One point is earned for showing minimum ATC on the horizontal demand curve at Q_{F1}.

(b)   1 point:
- One point is earned for stating that the demand curve for Farmer Roy's corn is perfectly elastic because Farmer Roy is a price taker or because he can sell all that he wants at the market price.

(c)   4 points:
- One point is earned for shifting the market demand curve to the right and showing P_{M2} and Q_{M2}.
- One point is earned for shifting the firm's demand curve upward to the level of P_{M2}.
- One point is earned for showing the profit-maximizing quantity, Q_{F2}, at MC = new MR.
- One point is earned for stating that ATC at Q_{F2} is lower than P_{M2}.

(d)   1 point:
- One point is earned for stating that the equilibrium quantity will decrease and the equilibrium price will increase, because the increase in the price of corn causes a decrease in the supply of cereal.