Microeconomic Analysis
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Problem Set #3

Instructions
(a) Answer all four questions.
(b) Unless you know how to do them on a computer, make sure to construct neat, scaled graphs using a ruler. I would recommend using graph paper.
(c) Answer each question *completely* and make sure that all your answers are in complete sentences. ***Make sure to show all calculations, and where appropriate illustrate with graphs***.
(d) Type all text (aside from any appearing on hand-constructed graphs) in a clear, legible font.
(e) Staple together or otherwise securely fasten all pages.
(f) The completed problem set must be handed to me at the beginning of class on November 26th. Sending me the problem set as an email attachment *would result in a one-grade reduction*, as would tardiness or failure to observe the above instructions.

Good luck!

1) The short-run cost function of a company is given by the equation $TC = 240 + 65q$, where TC is the total cost and q is the total quantity of output, both measured in thousands.
   a) What is the company's fixed cost?
   b) If the company produced 100,000 units of goods, what would be its average variable cost? What about its unit profit?
   c) What would be its marginal cost of production? Its average fixed cost?
   d) Suppose the company borrows money and expands its factory. Its fixed cost rises by $90,000, but its variable cost falls to $57,000 per 1000 units. The cost of interest (i) also enters into the equation. Each 1-point increase in the interest rate raises costs by $2,500. Write the new cost equation.

2) Suppose that a firm's production function is $q = 20L^{½}K^{½}$. The cost of a unit of labor is $3.60 and the cost of a unit of capital is $10.
   a) The firm is currently producing 300 units of output and has determined that the cost-minimizing quantities of labor and capital are 25 and 9, respectively. Graphically illustrate this using isoquants and isocost lines.
   b) The firm now wants to increase output to 360 units. If capital is fixed in the short run, how much labor will the firm require? Illustrate this graphically and find the firm's new total cost. It is ok throughout to show fractional units.
   c) Graphically identify the cost-minimizing level of capital and labor in the long run if the firm wants to produce 360 units.
   d) If the marginal rate of technical substitution is K/L, find the optimal level of capital and labor required to produce 360 units.

3) Suppose you are given the following information about a particular industry:

$QD = 6500 - 100P$ Market Demand

$QS = 1200P$ Market Supply

$C(q) = 900 + q^2/200$ Firm total cost function

$MC(q) = 2q/200$ Firm marginal cost function

a) Find the equilibrium price, the equilibrium quantity, the output supplied by the firm, and the profit of each firm.
b) How many firms are there in the market?
c) Would you expect to see entry into or exit from the industry in the long run? Explain. What effect would entry or exit have on equilibrium price and quantity? Be specific
d) What is the lowest price at which each firm would sell its output in the long run? Is profit positive, negative, or zero at this price? Explain.
e) What is the lowest price at which each firm would sell its output in the short run? Is profit positive, negative, or zero at this price? Explain.

4) Given the following supply and demand curves for widgets,

$Q_S = 10P$ and $Q_D = 1050 - 4P$,

a) What are equilibrium price and quantity?

b) Now assume that widget producers feel that their incomes are too low and have convinced the government that price supports are necessary. The government agrees to buy as many widgets as necessary to keep the price at $100. How much would this program cost the government? Show calculations and illustrate with a diagram.

c) How much would the program cost consumers in terms of lost consumer surplus? What would need to be true about the demand curve for the lost consumer surplus to exceed $18,000?

d) Show the overall net welfare effects of the price support policy. (Hint: think in terms of consumer and producer surplus and cost to government).