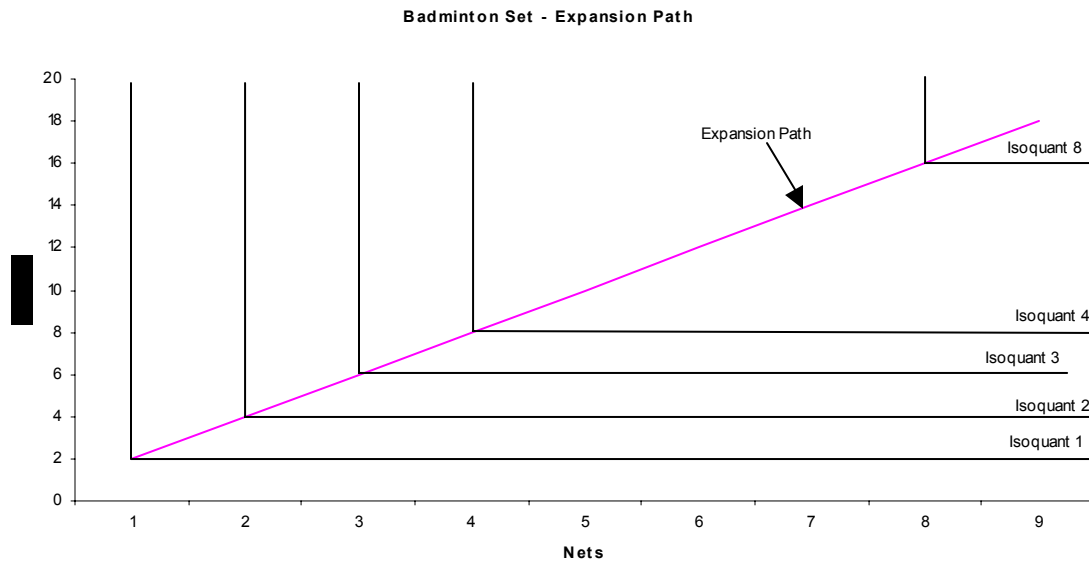


Answers to Problem Set #3

1. A badminton set includes two rackets and one net. What is the long-run expansion path for a firm that assembles such sets (and no additional cost), if the firm buys rackets and nets at market prices? How does the expansion path depend on the relative prices of rackets and nets?

The two inputs of the badminton set, the rackets and nets, are complements, and as such the isoquants are right-angled as shown in graph below.

For each isoquant, the tangent isocost necessarily will be tangent to the isoquant at the right-angle point, and will not depend on the relative prices of rackets and nets. Even if the price of one input is infinitely more expensive than the other, the firm will chose the lowest cost and therefore the right-angle point of the isoquant. Hence, the expansion path will follow the right-angle points of the isoquants, as show in graph below.



2. A bottling company uses two inputs to produce bottles of the soft drink Squish: bottling machines (K) and workers (L). The machine costs \$1,000 per day to run; and the workers earn \$200 per day. At the current level of production, the marginal product of the machine is an additional 200 bottles per day, and the marginal product of labor is 50 more bottles per day. Is this firm producing at minimum cost? If it is minimizing costs, explain why. If it isn't minimizing costs, explain how the firm should change the ratio of inputs it uses to lower its cost. (Be sure to discuss the conditions for minimizing cost.)

The firm would be producing at minimum cost if $MPL/w = MPK/r$, assuming it can use any combination of labor and machines.

When calculating MPL/w and MPK/r , we find that:
 $MPL/w = 50/200 = 0.25$ and $MPK/r = 200/1000 = 0.2$

Since MPL/w is not the same as MPK/r , the firm is not producing at minimum cost. Actually the firm gets more output per \$ from the workers than from the machine. The firm should therefore use more labor and less machines

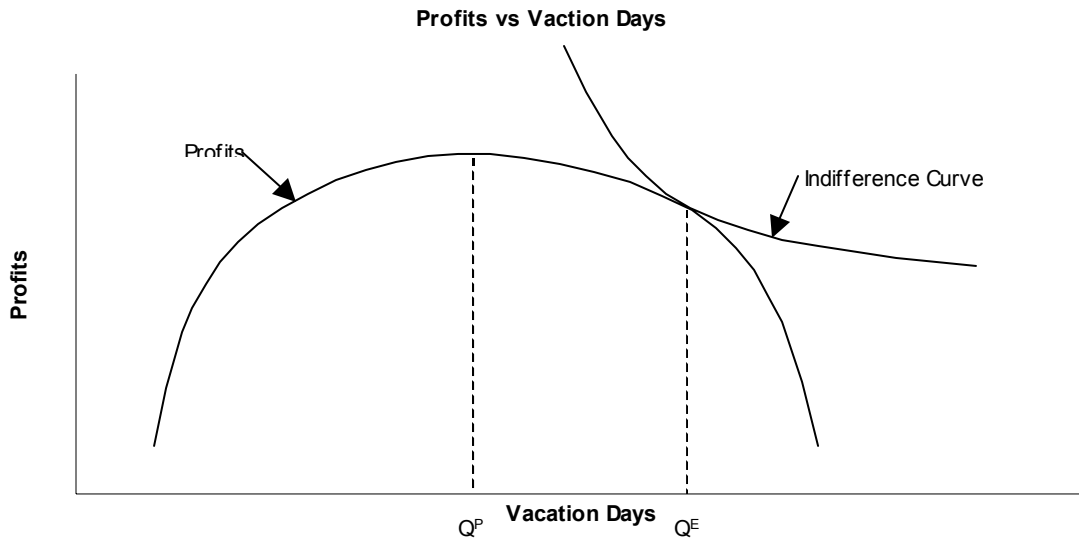
3. What is the long-run cost function for a production function where L and K are perfect substitutes, and each unit of q requires one unit of L or one unit of K (or a combination of the two that adds to one)? [Note: This production function can be written as $q = L + K$.]

Since L and K are perfect substitutes and the $MPL = MPK$, the firm will use labor or capital depending on which one is cheaper. One can therefore write long-run cost function as:

$$TC = \min(Lw, Kr) \text{ or } TC = \min(w, r) \times q$$

4. If we plot the profit of a firm against the number of vacation days taken by its owner, we find that profit first rises with vacation days (a few days of vacation improves the owner's effectiveness as a manager the rest of the year), but eventually falls as the owner takes more vacation days. If the owner has usual shaped indifference curves between profit and vacation days, will the owner take the number of vacation days that maximizes profit? If so, why? If not, what will the owner do, and why?

The graph below shows the profit curve, and the indifference curve described in the question. The owner maximizes profits by taking Q^P vacation days. However, he/she will take Q^E vacation days, because it is then that his/her indifference curve is tangent to the profit curve. As the result, the owner takes too many vacation days relative to the profit-maximizing number of vacation days.



5. If each competitive firm in an industry has the short-run cost function $C = 50 + 5q + q^2$, and the market price is \$35, what is the profit-maximizing output level for each firm? What is its total revenue? What is its profit? At what price does it shut down?

Profit is maximized by producing up to when $MC = MR$. In this case, $MR = p$, therefore the firm should produce until $MC = p$.

$$MC = dC/dq = 5 + 2q$$

When setting $MC = p$, we find that $q = 15$.

When $q = 15$:

$$\text{Total revenue, } p \times q, \text{ is equal to } 15 \times 35 = 525$$

$$TC = 50 + (5 \times 15) + (15^2) = 350$$

$$\text{Profits} = TR - TC = 525 - 350 = 175$$

In the short-run, the firm will shut down at minimum of AVC.

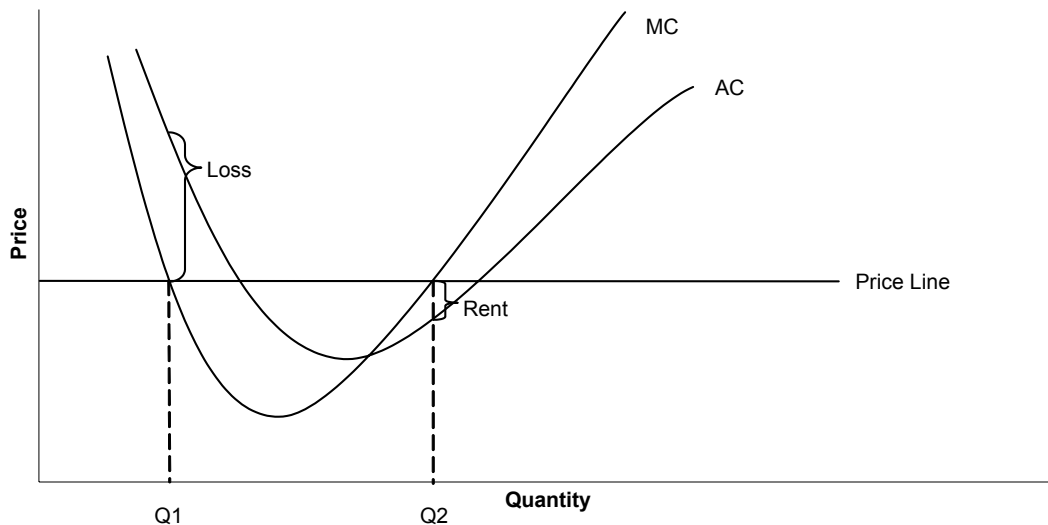
$$AVC = VC/q = 5q + q^2/q = 5 + q$$

AVC is at a minimum when $q = 0$. This means that the firm would shutdown at a price below \$5.

6. Many marginal cost curves are U-shaped. As a result, it is possible that the MC curve hits the demand or price line at two output levels. Which is the profit maximizing output? Why?

The graphs shows U-shaped marginal cost curve that intercepts the price line at two output levels, Q_1 and Q_2 .

The profit maximizing output cannot be Q_1 , since at that level of output the price line is below the average cost, and the firm is making a loss on each unit it sells. Actually Q_1 minimizes profits (maximizes losses). At Q_2 , however, the price line is above the average cost of producing each unit, and therefore the firm is earning a rent on each unit it is producing. The profit maximizing output is therefore Q_2 .



7. Each firm in a competitive market has a cost function of $C = 8 + 2q^2$. The market demand function is $Q = 24 - p$. Determine the equilibrium price, quantity per firm, market quantity, and number of firms.

Since this is a competitive market, firm will produce until $MC = AC$, because any price above AC will invite firms to enter the market.

$$MC = dC/dq = 4q$$

$$AC = C/q = 8/q + 2q$$

At $MC = AC$, $q = 2$. Each firm will therefore produce 2 units of output.

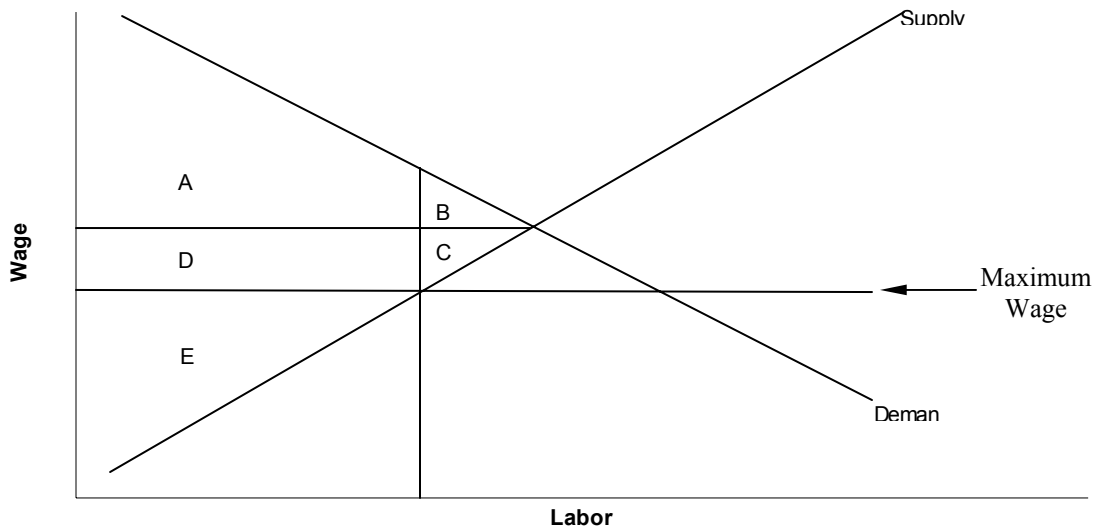
If $q = 2$, price will be \$8 ($MC=4 \times 2$ or $AC=8/2+2 \times 2$)

At a price of \$8, market demand will be 16. If each firm produces 2 units, then there will be 8 firms in the market.

8. If marginal cost is constant at \$5 for all firms, what is the value of producer surplus?

If margin cost is constant at \$5 for all firms, market supply will be horizontal at \$5. If market supply is horizontal, perfectly elastic, there will be no producer surplus.

9. Suppose instead of a minimum wage, the government instituted a maximum wage (set below the equilibrium) in the unskilled labor market. Show the welfare effects of this cap on the market using a graph.



	Without Maximum Wage	With Maximum Wage
Consumer Surplus	A+B	A+D
Producer Surplus	D+C+E	E
Total Welfare	A+B+C+D+E	A+D+E

Deadweight loss is B+C

10. What are the positions on trade of Senator Kerry and President Bush? In answering this question, consider their behavior, not just their recent public statements (Senator Kerry's voting history and President Bush's actions in office to date). What reasons do they give for favoring or opposing free trade? [If you find it difficult to determine their positions, you're not alone.]

This website contain information on John Kerry's stance on trade:

<http://www.johnkerry.com/issues/trade/>

This is an article about George Bush stance on trade:

<http://www.foxnews.com/story/0,2933,114928,00.html>

At least since he was attacked in the primaries by Senator Edwards, Senator Kerry has repeatedly spoken in ways that suggest that he is opposed to free trade. However, he has voted for virtually every free-trade agreement. President Bush normally speaks in favor of free trade, however, he has imposed tariffs on steel imports and has acted in other ways to protect U.S. firms from foreign competition.