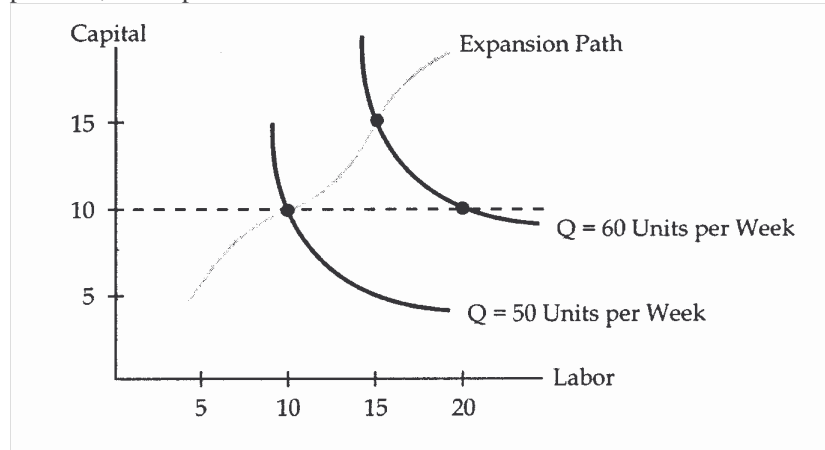


**Homework Quiz: Wednesday, March 19**

1. A firm has the production function  $\sqrt{KL}$ . Using calculus, the  $MPL = 1/2L^{-1/2}K^{1/2}$ , and the  $MPK = 1/2L^{1/2}K^{-1/2}$ . The wage rate is \$8 per hour and the rental rate is \$2 per hour. The firm decides to set output equal to 8 units.

- i. What is the optimal level of K? \_\_\_\_\_
- ii. What is the optimal level of L? \_\_\_\_\_
- iii. What are the firm's total costs? \_\_\_\_\_

2. Refer to the diagram below. The wage rate ( $P_L$ ) is assumed to be \$30 per hour, the capital rental rate ( $P_K$ ) is assumed to be \$15 per hour, and capital is assumed to be fixed in the short run at 10 units.



- i. What is the short-run *total* cost of producing 60 units of output per week?
- ii. What is the long-run *average* cost of producing 60 units of output per week?
- iii. By comparing the two points on the expansion path, we can conclude that this technology exhibits
  - a. decreasing returns to scale.
  - b. constant returns to scale.
  - c. increasing returns to scale.
  - d. zero returns to scale.

3. Chapter 7, Numerical Exercises N1, N2

4. Widgets are provided by a competitive constant-cost industry where each firm has fixed costs of \$30. The following chart shows the industry-wide demand curve and the marginal cost curve of a typical firm.

Industry Wide Demand		Firm's Marginal Cost Curve	
Price	Quantity	q	MC
\$5	1500	1	\$5
10	1200	2	10
15	900	3	15
20	600	4	20
25	300	5	25
30	200	6	30
35	140	7	35
40	50	8	40

- a. Assume the industry is at its long-run competitive equilibrium. What is the price of a widget?

b. How many firms are in the industry?

Suppose there is a SALES tax of \$15 per widget.

c. In the short run, what is the new price of widgets?

d. In the short run, how many firms leave the industry?

e. In the long-run what is the new price of widgets?

f. In the long-run, how many firms leave the industry?

5. The marginal revenue curve of a competitive firm is

- a. U-shaped.
- b. a ray from the origin.
- c. a horizontal line at the market price.
- d. downward sloping.

6. A firm will shut down in the short run if its revenues fail to cover its

- a. fixed costs.
- b. variable costs.
- c. total costs.
- d. sunk costs.

7. A competitive firm will exit an industry in the long run when the market price falls below its

- a. marginal revenue.
- b. marginal cost.
- c. average cost.
- d. average variable cost.

8. Suppose all firms in an industry are identical. In the long run, entry and exit guarantee that all firms will have zero

- a. marginal cost.
- b. average cost.
- c. economic profit.
- d. accounting profit.

9. In assignment #1, problem 2, the demand curve for a good was given by the equation  $Q = -4P + 2500$  ( $P = -1/4 * Q + 125$ ) and the supply curve was given by  $Q = 2P - 100$  ( $P = 1/2Q + 50$ ). We found the equilibrium price and quantity to be \$100 and 100 units.

- i. Calculate consumer surplus at this equilibrium price and quantity.
- ii. Calculate producer surplus at this equilibrium price and quantity.
- iii. Calculate total social gain at this equilibrium price and quantity.

In another part of the problem, we assumed the government imposed a sales tax of \$6 per unit. With this tax, we found the new market price to be \$96 and the new quantity to be 92 units.

- iv. Calculate the post-tax consumer surplus at this new equilibrium price and quantity.
- v. Calculate the post-tax producer surplus at this new equilibrium price and quantity.
- vi. Calculate the tax revenue collected from the government.
- vii. Calculate the post-tax total social gain assuming the tax revenue is re-distributed to support public education.
- viii. Calculate deadweight loss.
- ix. Illustrate the effect of this tax graphically. Label the following areas as follows:
  1. A- consumer surplus
  2. B- producer surplus
  3. C- tax revenue
  4. D- deadweight loss