

Name \_\_\_\_\_

Economics 111 S03: Intermediate Microeconomics  
Spring 2006  
Midterm 2 Answer Key

You have 1 hour and 20 minutes. Only clarifying questions are allowed. Do not cheat. Do not panic. Enjoy the exam.

Questions 1 to 5 are multiple choice. Circle the correct answer. (5 points each correct answer - there were two versions of these questions with shuffled answers).

1. In his analysis of "The economics of legalizing drugs," the Armchair Economist mentions 5 principles of cost-benefit welfare analysis. Which of the following is not one of them:

- a. Tax revenues are not a net benefit.
- b. Don't double count.
- c. A cost is a cost, no matter who bears it.
- d. A good is a good no matter who owns it.
- e. Consumer surplus from drug consumption is not a social surplus. ✓

2. The Cobb-Douglas production function  $y = x_1^\alpha x_2^\beta$ , with  $\alpha, \beta > 0$ , displays decreasing returns to scale if the following is true:

- a.  $\alpha < 1$  and  $\beta < 1$ .
- b.  $\alpha + \beta < 1$ . ✓
- c.  $\alpha + \beta > 1$ .
- d. all of the above.
- e. none of the above.

3. If the production function is  $y = \min\{x_1, \frac{x_2}{2}\}$  and the prices of inputs are  $w_1$  and  $w_2$ , the minimum cost function is:

- a.  $C(w_1, w_2, y) = (\frac{w_1}{2} + w_2) y$ .
- b.  $C(w_1, w_2, y) = (2w_1 + w_2) y$ .
- c.  $C(w_1, w_2, y) = (w_1 + 2w_2) y$ . ✓
- d.  $C(w_1, w_2, y) = \sqrt{w_1 w_2 y}$ .
- e.  $C(w_1, w_2, y) = 2w_1 w_2 y$ .

4. Consider a profit maximizing firm that uses **one** input to produce one output. If the price of the output increases, the following **must** be true:

- a. the optimal amount of output and input increases. ✓
- b. the optimal amount of output increases while the amount of input decreases.
- c. the optimal amount of output decreases.
- d. the optimal amount of input decreases.
- e. none of the above.

5. If the minimum cost function is  $C(y) = 10 + y^2$ , what is the short run supply function of the firm?

- a.  $y^* = \sqrt{\frac{p}{2}}$ .
- b.  $y^* = \frac{2}{p}$ .
- c.  $y^* = \frac{p}{2}$ . ✓
- d.  $y^* = p$ .
- e. none of the above.

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6. (25 points) Consider the following production function:  $f(x) = x^{\frac{1}{2}}$ .

a. Assume that  $p$  and  $w$  are given. Write profits as a function of the level of input and find the optimal amount of input  $x^*$ . How does  $x^*$  depend on  $p$  and  $w$ ?

$$\pi = px^{\frac{1}{2}} - wx$$

$$\text{FOC: } \frac{d\pi}{dx} = \frac{1}{2}px^{-\frac{1}{2}} - w = 0$$

$$\text{SOC: } \frac{d^2\pi}{dx^2} = -\frac{1}{4}px^{-\frac{3}{2}} < 0$$

From the FOC we solve for  $x$ :  $x^* = \left(\frac{p}{2w}\right)^2$ . The demand of the input depends positively on the price of the output and negatively on the price of the input.

b. Using the previous solution find the supply function. How does  $y^*$  depend on  $p$  and  $w$ ?

$$y^* = f(x^*) = \frac{p}{2w}$$

The supply of the output depends positively on the price of the output and negatively on the price of the input.

c. Find the minimum cost function given  $y$  and  $w$ .

$$C(w, y) = wy^2$$

d. Using the cost function from point d, find the supply function.

$$\pi = py - wy^2$$

$$\text{FOC: } \frac{d\pi}{dy} = \frac{1}{2}p - 2wy = 0$$

$$\text{SOC: } \frac{d^2\pi}{dy^2} = -2w < 0$$

From the FOC we solve for  $y$ :  $y^* = \frac{p}{2w}$ .

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7. (30 points) Consider the following market:

Supply:  $S(p) = 2p - 2$ .

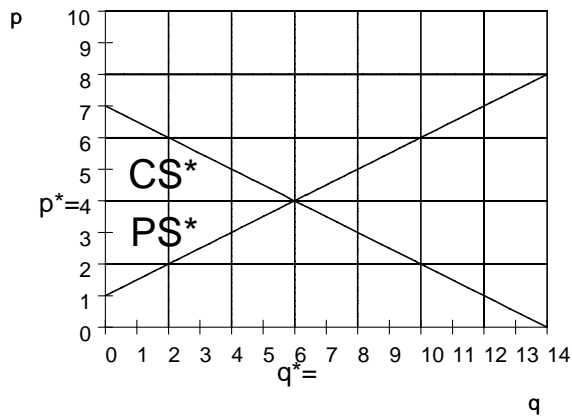
Demand:  $D(p) = 14 - 2p$ .

a. What is the perfect competitive equilibrium price and quantity?

$p^*=4$  and  $q^*=6$ .

b. What is the consumer surplus, producer surplus and total surplus? Show the consumer and producer surpluses graphically.

$CS^*=9$ ,  $PS^*=9$  and  $TS^*=CS^*+PS^*=18$

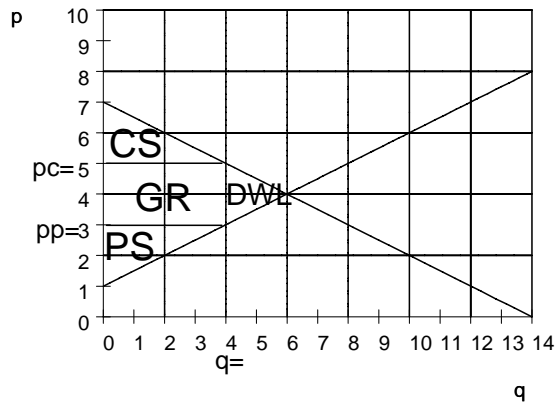


c. Consider now that a two dollar tax per unit is imposed on producers. What is the perfect competitive equilibrium price paid by consumers, earned by producers and the equilibrium quantity under the tax?

$$p^c=5, p^p=3 \text{ and } q^t=4.$$

d. What is now consumer surplus and the producer surplus? How much is the government's revenue? The total surplus? How much is the deadweight loss? Show all these graphically.

$$CS^t=4, PS^t=4, GR^t=8 \text{ and } TS^t=CS^t+PS^t+GR^t=16. \text{ } DWL^t=TS^*-TS^t=2.$$



e. How is the burden of the tax distributed between consumers and producers?

Evenly since  $p^c - p^* = p^* - p^t$ .

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8. (20 points) Consider the following production function:  $f(x) = x_1^{\frac{1}{2}}x_2^{\frac{1}{2}}$ .

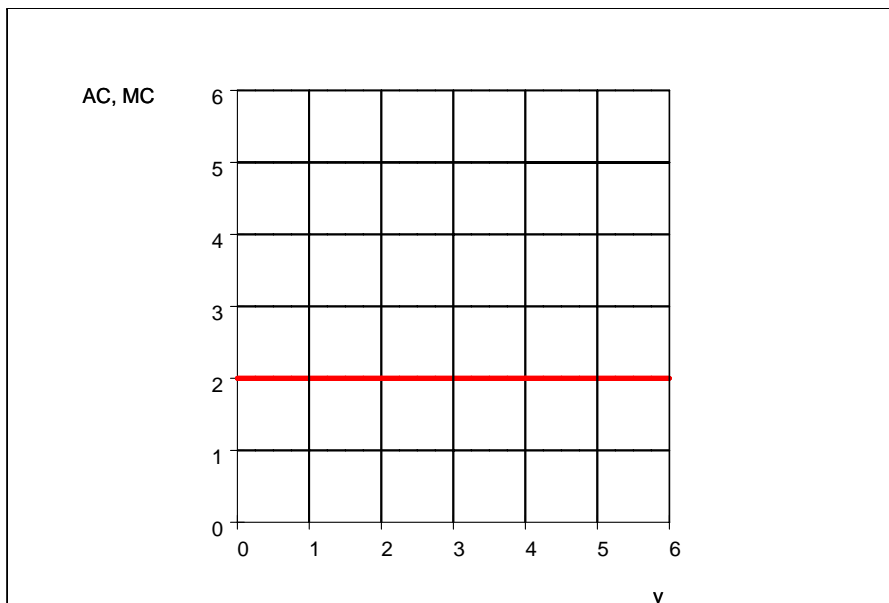
a. Find the minimum cost function. How does it depend on  $w_1$ ,  $w_2$  and  $y$ ?

$$C(w_1, w_2, y) = 2(w_1w_2)^{\frac{1}{2}}y$$

The minimum cost function is increasing in the prices of the inputs and the amount produced.

b. Find the average and marginal cost. Graph them assuming  $w_1 = w_2 = 1$ .

$$AC(y) = MC(y) = 2$$



c. Does this production function have increasing, constant or decreasing returns to scale?

CRS.