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Economics 111 S01: Intermediate Microeconomics  
Spring 2008  
Midterm 2a Answer Key

You have 1 hour and 20 minutes. Only clarifying questions are allowed. Do not cheat. Do not panic. Enjoy the exam. The other version of the exam varies on the order of the answer or other small changes.

Questions 1 to 5 are multiple choice. Circle the correct answer. (5 points each correct answer).

1. The production function is  $y = x_1 + x_2$  and the prices of inputs are  $w_1$  and  $w_2$ . If  $w_1 > w_2$ , then the minimum cost function is:

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

2. The production function  $y = x^\alpha$ , with  $\alpha > 0$ , displays increasing returns to scale if the following is true:

- a.  $\alpha < 1$ .
- b.  $\alpha > 1 \cdot \sqrt{\quad}$
- c.  $\alpha + \beta > 1$ .
- d. all of the above.
- e. none of the above.

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

- a.  $C(w_1, w_2, y) = \left(\frac{w_1}{2} + w_2\right) y$ .
- 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.  $C(w_1, w_2, y) = \left(w_1 + \frac{w_2}{2}\right) y$ .
- e.  $C(w_1, w_2, y) = 2w_1w_2y$ .

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

- a. the optimal amount of output and input increase.
- b. the optimal amount of output decreases.
- c. the optimal amount of output increases.
- d. the optimal amount of input increases.
- e. the optimal amount of output increases while the input decreases.

5. Alberto and Benito consume two goods. They trade only with each other, there is no production and the total endowments of both goods are equal. Alberto's utility function is  $U_A = \min\{x_{A1}, x_{A2}\}$  and Benito's is  $U_B = x_{B1} + 2x_{B2}$ . In their Edgeworth box, the set of Pareto efficient allocations is:

- a. the main diagonal.
- b. both diagonals.
- c. the entire box.
- d. the right and bottom edges of the box.
- e. the left and upper edges of the box.

6. (25 points) Consider the following production function:  $f(x) = x^{\frac{2}{3}}$ .

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  $w$ ?

$$x^* = \left(\frac{2p}{3w}\right)^3$$

Increasing on  $p$  and decreasing on  $w$ .

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

$$y^* = \left(\frac{2p}{3w}\right)^2$$

Increasing on  $p$  and decreasing on  $w$ .

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

$$C = wy^{\frac{3}{2}}$$

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

$$y^* = \left(\frac{2p}{3w}\right)^2$$

7. (30 points) Consider a world with two agents: A and B. The utility of A is  $U_A = \min\{\frac{x_{A1}}{2}, x_{A2}\}$  and the utility of B is  $U_B = x_{B1}x_{B2}$ . The initial endowments are  $\omega_A = (4, 1)$  and  $\omega_B = (2, 2)$ .

See answer key for Section 2 midterm.

8. (20 points) Consider the following production function:  $f(x) = x_1^{\frac{1}{3}}x_2^{\frac{1}{3}}$ .

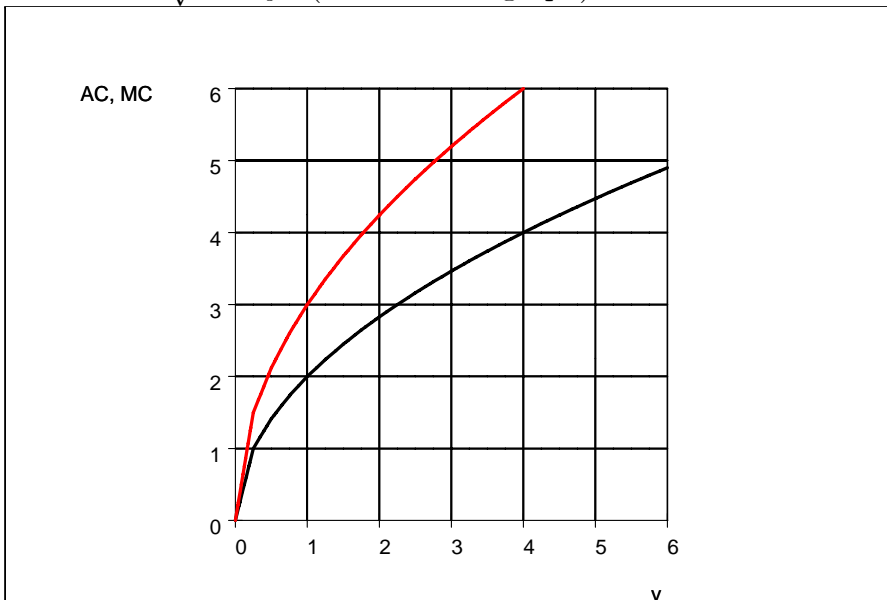
a. Find the minimum cost function. How does it depend on  $w_1$ ,  $w_2$  and  $y$ ?

$$x_1^c = \sqrt{\frac{w_2}{w_1}}y^{\frac{3}{2}} \text{ and } x_2^c = \sqrt{\frac{w_1}{w_2}}y^{\frac{3}{2}}. \text{ Then } C = w_1x_1^c + w_2x_2^c = 2\sqrt{w_1w_2}y^{\frac{3}{2}}$$

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

$$AC = 2\sqrt{w_1w_2}y^{\frac{1}{2}}$$

$$MC = 3\sqrt{w_1w_2}y^{\frac{1}{2}} \text{ (in red in the graph)}$$



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

Decreasing.