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Economics 111: Intermediate Microeconomics
Spring 2005
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).

1. The Armchair Economist says that taxes are:
 - a. bad since it is just the government stealing from the citizens.
 - b. bad because it is not nice to pay them.
 - c. bad because they can be avoided.✓
 - d. neither good or bad since they are just a transfer of money.
 - e. good because it is great fun to collect them.

Point d sounds correct but it is not. The Armchair Economist says that *tax revenues* are neither a benefit nor a cost. But that is different from whether taxes are good or bad. But since it is so close we will give 3 points to those that choose d.

2. A production function $y = x^\alpha$, with $\alpha > 0$, displays decreasing marginal productivity if the following is true:
 - a. $\alpha = 1$.
 - b. $\alpha < 1$.✓
 - c. $\alpha > 1$.
 - d. all of the above.
 - e. none of the above.

3. If the production function is $y = \min\{2x_1, x_2\}$ 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. $C(w_1, w_2, y) = \sqrt{w_1 w_2 y}$.
- e. $C(w_1, w_2, y) = 2w_1 w_2 y$.

4. In a perfect competitive market, a technological improvement that results in a reduction on the marginal cost of firms will result in:

- a. higher quantities and higher prices.
- b. higher quantities and lower prices.✓ (The supply function moves towards the south east.)
- c. lower quantities and higher prices..
- d. lower quantities and lower prices.
- e. none of the above.

5. If the minimum cost function is $C(y) = 100 + y^2$, the following is true:

- a. $AC(y) = 100 + y$ and $AVC(y) = y$.
- b. $AC(y) = 100 + y$ and $AVC(y) = 2y$.
- c. $AC(y) = y$ and $AVC(y) = y$.
- d. $AC(y) = \frac{100}{y} + y$ and $AVC(y) = 2y$.
- e. $AC(y) = \frac{100}{y} + y$ and $AVC(y) = y$.✓

(AC is average cost and AVC is average variable cost)

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6. (25 points) Consider the following production function: $f(x) = x^{\frac{1}{5}}$.

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 ?

$$\pi = px^{\frac{1}{5}} - wx$$

$$\text{FOC: } \frac{d\pi}{dx} = p\frac{1}{5}x^{-\frac{4}{5}} - w = 0$$

Then, $x^* = \left(\frac{p}{5w}\right)^{\frac{5}{4}}$ which is increasing in p and decreasing in w .

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

$$y^* = \left(\frac{p}{5w}\right)^{\frac{1}{4}} \text{ which is increasing in } p \text{ and decreasing in } w.$$

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

$$C(w, y) = wf^{-1}(y) = wy^5$$

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

P=MC implies $p = 5wy^4$ and $y^* = \left(\frac{p}{4w}\right)^{\frac{1}{4}}$ as in point b.

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7. (30 points) Suppose that the market for widgets can be described as follows:

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

Demand: $D(p) = 10 - p$.

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

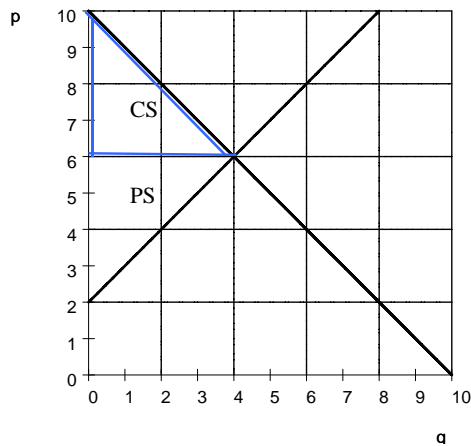
$$p^* = 6 \text{ and } q^* = 4.$$

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

$$CS^* = \frac{(10-6)4}{2} = 8$$

$$PS^* = \frac{(6-2)4}{2} = 8$$

$$TS^* = CS^* + PS^* = 16$$



Under heavy lobby by anti-widgets activists, Congress passes the "Widgets are Ugly Act" which establishes a tax on widgets of \$4. Consumers must pay \$4 to the government for each widget they buy.

c. What is the perfect competitive equilibrium price paid by consumers, earned by producers and the equilibrium quantity under the "Widgets are Ugly Act"?

$$p^p = 4, p^c = 8 \text{ and } q = 2.$$

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.

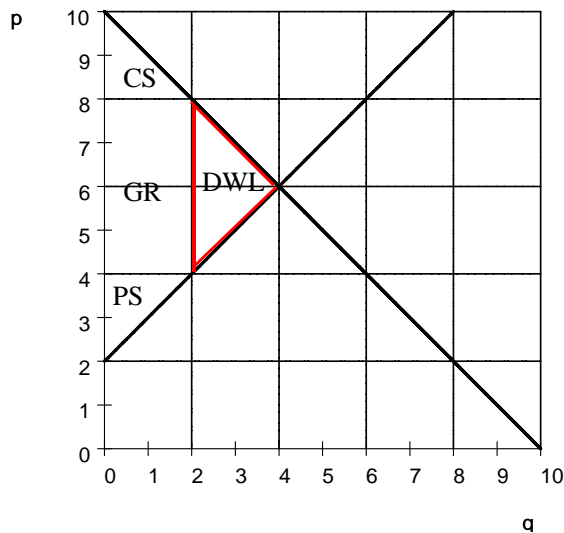
$$CS = \frac{(10-8)2}{2} = 2$$

$$PS = \frac{(4-2)2}{2} = 2$$

$$GR = 2 * 4 = 8$$

$$TS = CS + PS + GR = 12$$

$$DWL = 4$$



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8. (20 points) Consider the following market:

Demand: $D(p) = 12 - p$.

Production comes from two regions. The supply from region A is $S_A(p) = p$ and the supply from region B is $S_B(p) = p$.

a. What is the total supply function in this market for a given price p ?

$$S(p) = S_A(p) + S_B(p) = 2p$$

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

$$p^* = 4 \text{ and } q^* = 8.$$

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

$$CS^* = \frac{(12-4)8}{2} = 32$$

$$PS^* = \frac{8 \cdot 4}{2} = 16$$

$$TS^* = CS^* + PS^* = 48$$

