ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2012
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EXAMINATION #3 ANSWER KEY

Version A

I. MULTIPLE CHOICE

(1)a. (2)e. (3)f. (4)a. (5)b. (6)d. (7)c. (8)b. (9)b. (10)c.

II. SHORT ANSWER

(1) a. 2.4% b. 1.6%.

(2) a. 1000 units b. zero units c. 800 units
d. \$9 (min SATC) e. \$3 (min SAVC).

(3) a. import b. 6 thousand c. increase
d. \$16 thousand e. decrease f. \$10 thousand
g. gain h. \$6 thousand.

(4) a. 6 thousand pounds b. excess demand c. 3 thousand pounds
d. decrease e. \$7 thousand f. increase
g. \$4 thousand h. \$3 thousand.

III. PROBLEMS

(1) a. $AP_1 = q/x_1 = 20\, x_1^{-3/5}\, x_2^{4/5}$.
b. $MP_2 = \partial q/\partial x_2 = 16\, x_1^{2/5}\, x_2^{-1/5}$.
b. Yes diminishing returns because MP_2 is decreasing in x_2 : as x_2 increases, MP_2 decreases.
c. $MRSP = MP_2 / MP_1 = (16\, x_1^{2/5}\, x_2^{-1/5}) / (8\, x_1^{-3/5}\, x_2^{4/5}) = 2\, x_1 / x_2$.
e. $20\,(ax_1)^{2/5}\,(ax_2)^{4/5} = 20\, a^{2/5}\, x_1^{2/5}\, a^{4/5}\, x_2^{4/5} = a^{6/5}\, 20\, x_1^{2/5}\, x_2^{4/5} = a^{6/5}\, q \;>\; a\, q$.
Therefore this production function has *increasing returns to scale*.

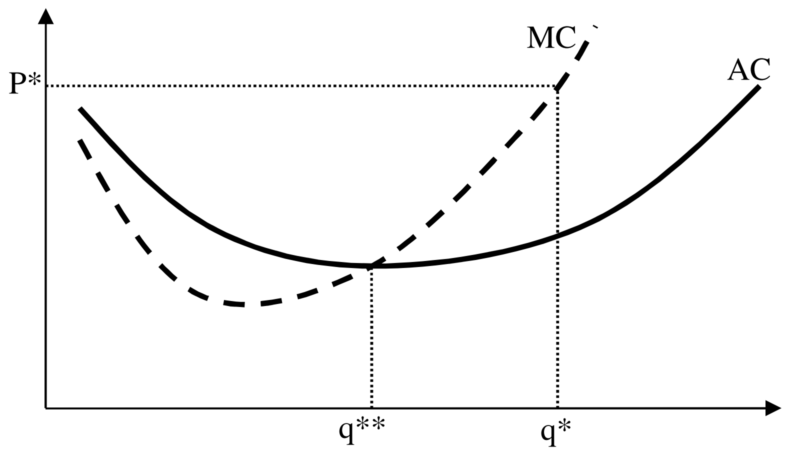
(2) a. $60 = 5\,(x_1^{-1} + x_2^{-1})^{-1}$.
b. $MRSP = MP_2 / MP_1 = \frac{-5\left(x_1^{-1}+x_2^{-1}\right)^{-1}(-1)x_2^{-2}}{-5\left(x_1^{-1}+x_2^{-1}\right)^{-1}(-1)x_1^{-2}} = \left(\frac{x_1}{x_2}\right)^2$.
c. Set $\left(\frac{x_1}{x_2}\right)^2 = \frac{9}{4}$ or $\left(\frac{x_1}{x_2}\right) = \frac{3}{2}$, and solve jointly with isoquant in part (a), to find **$x_1^* = 30$ and $x_2^* = 20$**.
d. $TC(60) = 4\, x_1^* + 9\, x_2^* =$ **\$300**.

(3) a. Set SMC = price, or q+1 = 11, to find q* = **10**.
b. STC = SVC + SFC = $0.5\; 10^2 + 10 + 8 = \$68$. Revenue = 10×11 = \$110.
So profit = \$110 - \$68 = **\$42**.
c. Breakeven price = minimum SATC. Now STC = SVC + SFC = $0.5\, q^2 + q + 8$, so SATC = 0.5 q + 1 + (8/q). To find minimum, set d SATC/ d q = 0, or $0.5 - 8/q^2 = 0$, to get q = 4. Substitute: SATC(4) = 0.5×4 + 1 + (8/4) = **\$5**.

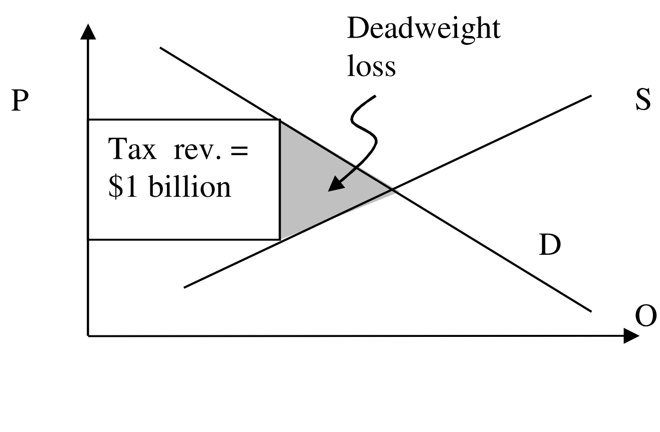
(4) Set $P_D = P_S$ and solve to get
a. 80 units = Q b. \$6 = P
Set $P_D = P_S$ + tax, or [14 – (Q/10)] = [2 + (Q/20)] + \$3, and solve to get
c. 60 units = Q d. \$8 = P_D e. \$5 = P_S f. \$30 = SDL.

IV. CRITICAL THINKING

(1) [The following answer uses a long-run framework, where there are no fixed costs. A similar answer in a short-run framework would be acceptable.] It is true that *per-unit profit* is maximized when the firm operates at the output level where average cost is lowest. However *total profit* is maximized when the firm operates at the output level where *market price equals marginal cost*, provided price is greater than minimum average cost. (If price is less than average cost, total profit is maximized when the output level is zero.) Thus, the total-profit-maximizing level of output depends on the market price. In general, the two output levels will be different, as shown in the graph below. Here, P* is the market price, q* is the output level that maximizes total profit, and q** is the output level where average cost is lowest.



(2) The loss of consumer and producer surplus in this market must exceed the tax revenue collected because some mutually beneficial trades will not take place under the tax. So the loss of consumer and producer surplus must be *greater* than the tax revenue collected ($1 billion) and rebated to the people. There is an additional loss, called deadweight loss. Therefore the country is *worse off* than if the tax and rebate did not exist.



Version B

I. MULTIPLE CHOICE

(1)c. (2)b. (3)b. (4)d. (5)c. (6)b. (7)b. (8)a. (9)d. (10)d.

II. SHORT ANSWER

(1) a. 2.1% b. 1.2%.
(2) a. 700 units b. 1100 units c. zero units
d. \$10 (min SATC) e. \$5 (min SAVC).
(3) a. export b. 12 thousand c. decrease
d. \$20 thousand e. increase f. \$44 thousand
g. gain h. \$24 thousand.
(4) a. 6 thousand pounds b. excess supply c. 6 thousand pounds
d. increase e. \$11 thousand f. decrease
g. \$14 thousand h. \$3 thousand.

III. PROBLEMS

(1) a. $AP_1 = q/x_1 = 20\ x_1^{-4/5}\ x_2^{3/5}$.
b. $MP_2 = \partial q/\partial x_2 = 12\ x_1^{1/5}\ x_2^{-2/5}$.
b. Yes diminishing returns because MP_2 is decreasing in x_2 : as x_2 increases, MP_2 decreases.
c. $MRSP = MP_2 / MP_1 = (12\ x_1^{1/5}\ x_2^{-2/5}) / (4\ x_1^{-4/5}\ x_2^{3/5}) = 3\ x_1 / x_2$.
e. $20\ (ax_1)^{1/5}\ (ax_2)^{3/5} = 20\ a^{1/5}\ x_1^{1/5}\ a^{3/5}\ x_2^{3/5} = a^{4/5}\ 20\ x_1^{1/5}\ x_2^{3/5} = a^{4/5}\ q < a\ q$.
Therefore this production function has *decreasing returns to scale*.

(2) a. $81 = (x_1^{1/2} + x_2^{1/2})^2$.
b. $MRSP = MP_2 / MP_1 = \frac{2\left(x_1^{1/2}+x_2^{1/2}\right)^{-1}(1/2)x_2^{-1/2}}{2\left(x_1^{1/2}+x_2^{1/2}\right)^{-1}(1/2)x_1^{-1/2}} = \left(\frac{x_1}{x_2}\right)^{1/2}$.
c. Set $\left(\frac{x_1}{x_2}\right)^{1/2} = \frac{8}{10}$ or $\frac{x_1^{1/2}}{x_2^{1/2}} = \frac{8}{10}$, and solve jointly with isoquant in part (a), to find **$x_1^* = 16$ and $x_2^* = 25$**.
d. $TC(81) = 10\ x_1^* + 8\ x_2^* =$ **\$360**.

(3) a. Set SMC = price, or q+1 = 21, to find q* = **20**.
b. STC = SVC + SFC = $0.5\ 20^2 + 20 + 50 = \$270$. Revenue = 20×21 = \$420.
So profit = \$420 - \$270 = **\$150**.
c. Breakeven price = minimum SATC. Now STC = SVC + SFC = $0.5\ q^2 + q + 50$, so SATC = 0.5 q + 1 + (50/q). To find minimum, set d SATC/ d q = 0, or $0.5 - 50/q^2 = 0$, to get q = 10. Substitute: SATC(10) = 0.5×10 + 1 + (50/10) = **\$11**.

(4) Set $P_D = P_S$ and solve to get
a. 80 units = Q b. \$6 = P
Set $P_D = P_S + \text{tax}$, or [14 – (Q/10)] = [2 + (Q/20)] + \$6, and solve to get
c. 40 units = Q d. $\$10 = P_D$ e. $\$4 = P_S$ f. \$120 = SDL.

IV. CRITICAL THINKING: Same as Version A.
[end of answer key]