ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2013
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EXAMINATION #3 ANSWER KEY

Version A

I. Multiple choice

(1)a. (2)b. (3)a. (4)d. (5)c. (6)d. (7)b. (8)b. (9)b. (10)d.
(11)d. (12)f. (13)c.

II. Short answer

(1) a. 2.0 % . b. 1.5 %.

(2) a. zero units (shut down). b. 1200 units. c. 1000 units.
d. \$7. e. \$3.

(3) a. \$5. b. 4 thousand. c. \$3 per pound.
d. \$9 per pound. e. decrease. f. \$12 thousand.
g. decrease. h. \$24 thousand. i. \$24 thousand.
j. \$12 thousand.

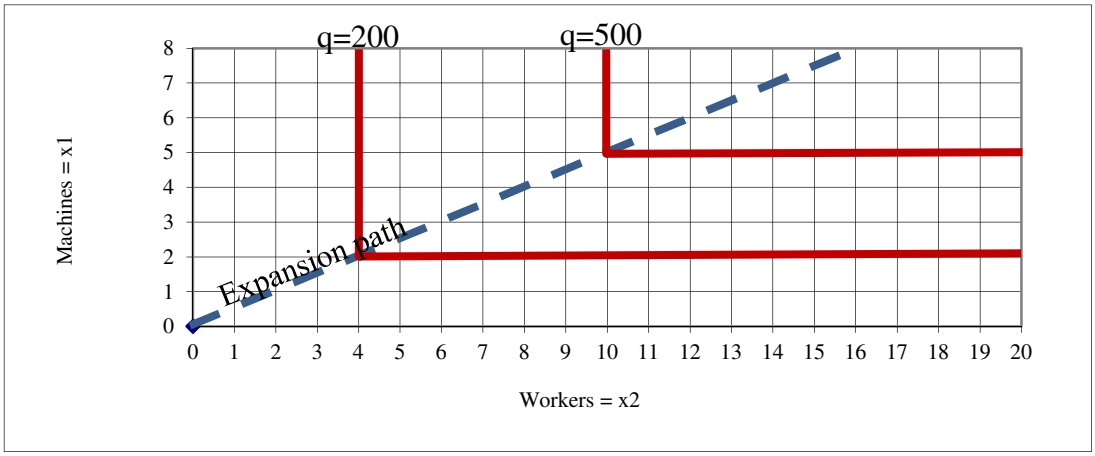
III. Problems

(1) a. $MP_1 = 3\,x_1^{-3/4}\,x_2^{3/4} = 3\,(x_2/x_1)^{3/4}$. YES, there are diminishing returns to input 1, because as x_1 increases (and x_2 is held constant), MP_1 decreases.

b. $MRSP = MP_2/MP_1 = \frac{9\,(x_1/x_2)^{1/4}}{3\,(x_2/x_1)^{3/4}} = 3x_1/x_2$. YES, this function has diminishing MRSP, because as x_1 decreases and x_2 increases, MRSP diminishes.

c. Check returns to scale:
$f(ax_1, ax_2) = 12\,(ax_1)^{1/4}\,(ax_2)^{3/4} = a^{1/4}\,a^{3/4}\,12\,x_1^{1/4}x_2^{3/4} = aq$.
This function has CONSTANT returns to scale.

(2) a. $x_1 = (x_2/2)$. b. $q = 100\,x_1$. c. $q = 100\,(x_2/2)$.
d. $q = \min\{100\,x_1\,,\,100\,(x_2/2)\}$,
e.



(3) a. $200 = 4\ x_1^{1/2}\ x_2^{1/2}$.

b. $MRSP = MP_2/MP_1 = \frac{(1/2)\,4\,x_1^{1/2}x_2^{-1/2}}{(1/2)\,4\,x_1^{-1/2}x_2^{1/2}} = x_1/x_2$.

c. Set MRSP = \$40/\$10 and solve jointly with $200 = 4\ x_1^{1/2}\ x_2^{1/2}$, to get x_1*=25 and x_2*=100.

d. TC(200) = 25×\$40 + 100×\$10 = \$2000.

(4) a. $AC = TC/q = q^2 - 100q + 2510$. Set $0 = dAC/dq = 2q\text{-}100$ and solve to get $q_{ES} = 50$.

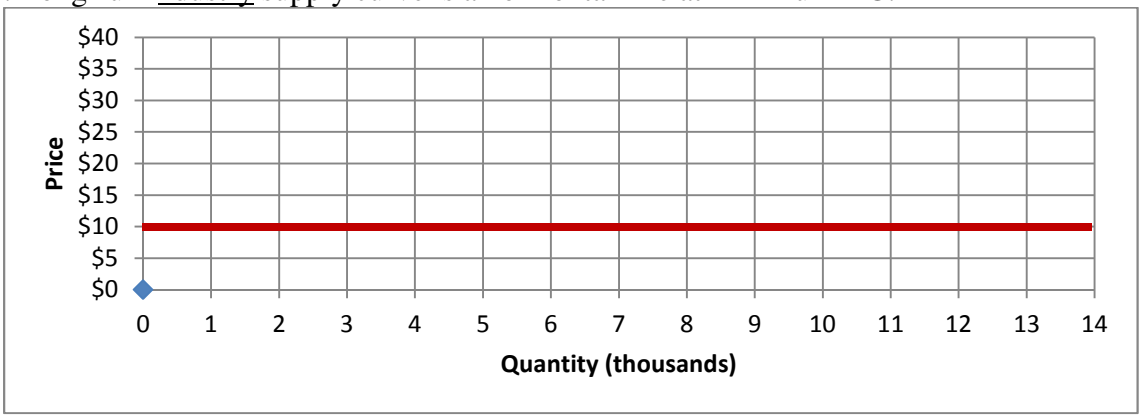
b. Breakeven price = minimum AC = $AC(q_{ES})$ = \$10.

c. Firm's supply curve is as follows.

If P>\$10, $P = MC(q) = dTC/dq = 3q^2 - 200q + 2510$.

If P<\$10, q=0 (firm shuts down).

d. Long-run industry supply curve is a horizontal line at minimum AC:



(5) a. Set $Q_D = Q_S$ and solve to get P=\$5. (Also note that $Q_D = Q_S = 50$ units.)

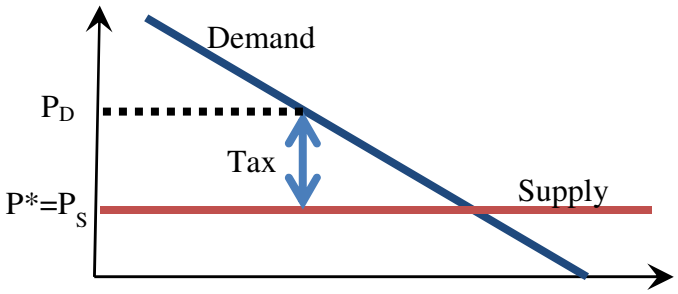
b. Consumer surplus decreases by \$105, the area of the small trapezoid.

c. Producer surplus increases by \$240, the area of the big trapezoid.

d. The country as a whole gains by \$240-\$105 = \$135.

IV. Critical thinking

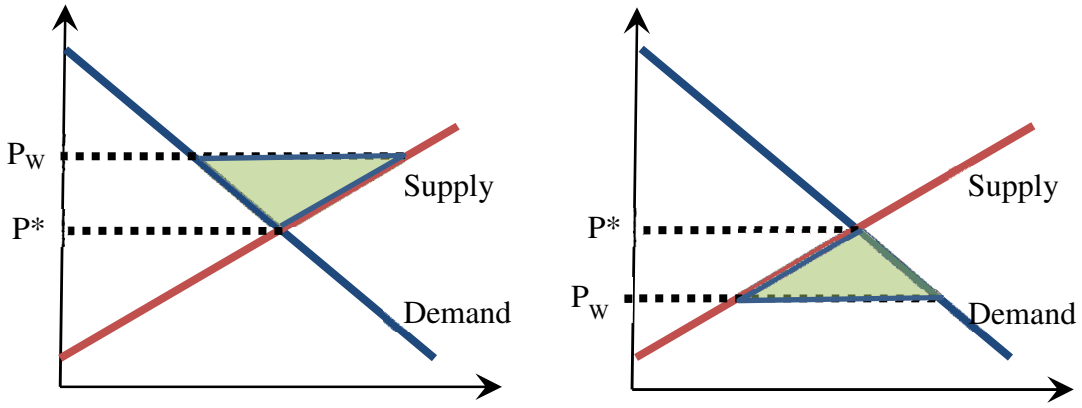
(1) In this situation, a tax raises the total price (including the tax) paid by buyers, but has no effect on the net price (excluding the tax) received by sellers. Also, consumer surplus is reduced by the tax, but producer surplus is still zero and unchanged as a result of the tax. So buyers bear the entire burden of the tax. See graph below.



(2) One should *disagree* with this claim. If the world price is *greater* than the domestic price, then domestic consumers lose from international trade, but producers win. The increase in

producer surplus is greater than the decrease in consumer surplus, so the country is better off from international trade. Gains from trade are shaded in the graph below at left.

Moreover, if the world price is *less* than the domestic price, then domestic consumers win from international trade, but producers lose. However, the increase in consumer surplus is greater than the decrease in producer surplus, so the country is again better off from international trade. See graphs below. Gains from trade are shaded in the graph below at right.



Version B

I. Multiple choice

(1)d. (2)c. (3)b. (4)b. (5)d. (6)a. (7)a. (8)d. (9)a. (10)c.
(11)e. (12)a. (13)g.

II. Short answer

(1) a. 1.8 % . b. 2.2 %.

(2) a. 1300 units. b. zero units (shut down). c. 1200 units.
d. \$8. e. \$4.

(3) a. \$5. b. 10 thousand. c. \$6 per pound.
d. \$3 per pound. e. increase. f. \$9 thousand.
g. increase. h. \$18 thousand. i. \$30 thousand.
j. \$3 thousand.

III. Problems

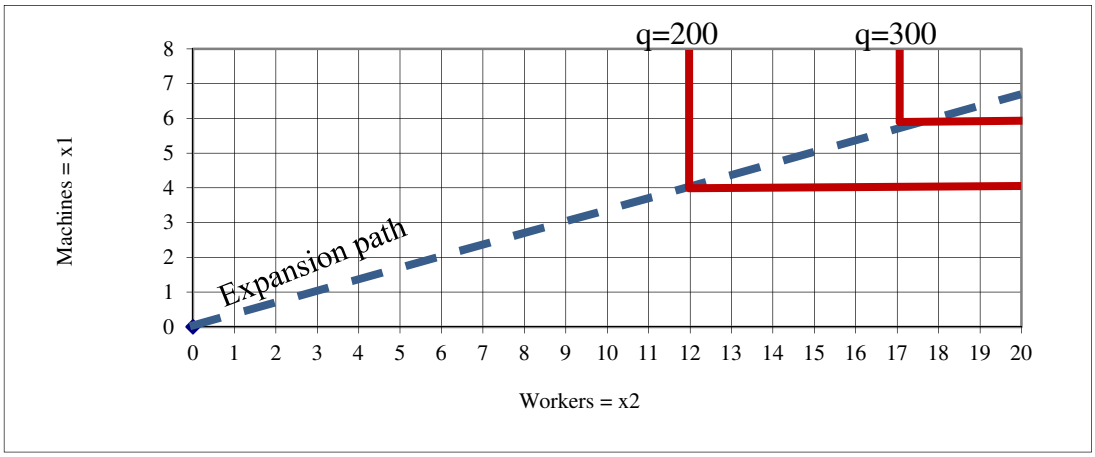
(1) a. $MP_1 = 6\,x_1^{-1/2}\,x_2^{3/4}$. YES, there are diminishing returns to input 1, because as x_1 increases (and x_2 is held constant), MP_1 decreases.

b. $MRSP = MP_2/MP_1 = \frac{9\,x_1^{1/2}x_2^{-1/4}}{6\,x_1^{-1/2}x_2^{3/4}} = (3x_1)/(2x_2)$. YES, this function has diminishing MRSP, because as x_1 decreases and x_2 increases, MRSP diminishes.

c. Check returns to scale:
$f(ax_1, ax_2) = 12\,(ax_1)^{2/4}\,(ax_2)^{3/4} = a^{2/4}\,a^{3/4}\,12\,x_1^{1/4}x_2^{3/4} = a^{5/4}q > aq$.
This function has INCREASING returns to scale.

(2) a. $x_1 = (x_2/3)$. b. $q = 50\,x_1$. c. $q = 50\,(x_2/3)$.
d. $q = \min\{50\,x_1\,,\,50\,(x_2/3)\}$,

e.



(3) a. $600 = 10\, x_1\, x_2$.

b. $MRSP = MP_2/MP_1 = \frac{10\, x_1}{10\, x_2} = x_1/x_2$.

c. Set MRSP = \$24/\$10 and solve jointly with $600 = 10\, x_1\, x_2$, to get $x_1^*=12$ and $x_2^*=5$.

d. TC(600) = 12×\$10 + 5×\$24 = \$240.

(4) a. $AC = TC/q = q^2 - 40q + 430$. Set $0 = dAC/dq = 2q-40$ and solve to get $q_{ES} = 20$.

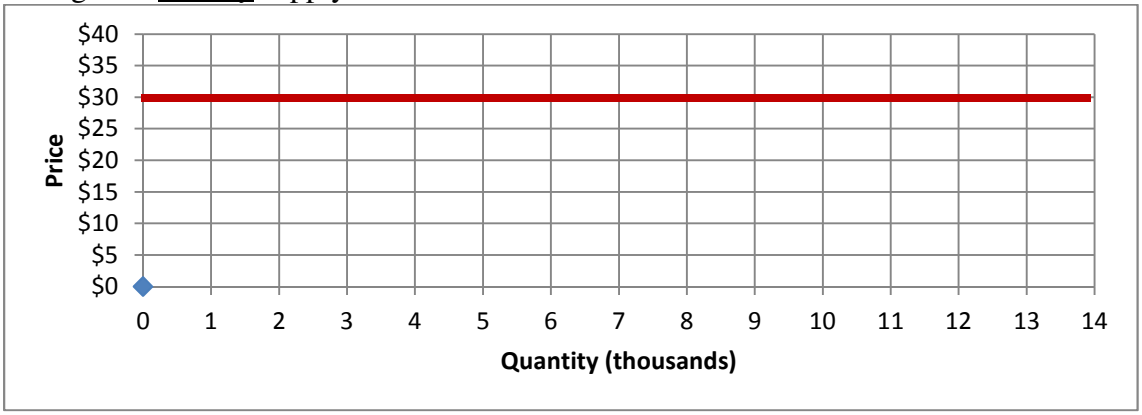
b. Breakeven price = minimum AC = $AC(q_{ES})$ = \$30.

c. Firm's supply curve is as follows.

If P>\$30, $P = MC(q) = dTC/dq = 3q^2 - 80q + 430$.

If P<\$30, q=0 (firm shuts down).

d. Long-run industry supply curve is a horizontal line at minimum AC:



(5) a. Set $Q_D = Q_S$ and solve to get P=\$5. (Also note that $Q_D = Q_S = 50$ units.)

b. Consumer surplus increases by \$120, the area of the big trapezoid.

c. Producer surplus decreases by \$60, the area of the small trapezoid.

d. The country as a whole gains by \$120-\$60 = \$60.

IV. Critical thinking

Same as Version A.

[end of answer key]0