

## EXAMINATION #3 ANSWER KEY

### Version A

#### I. Multiple choice

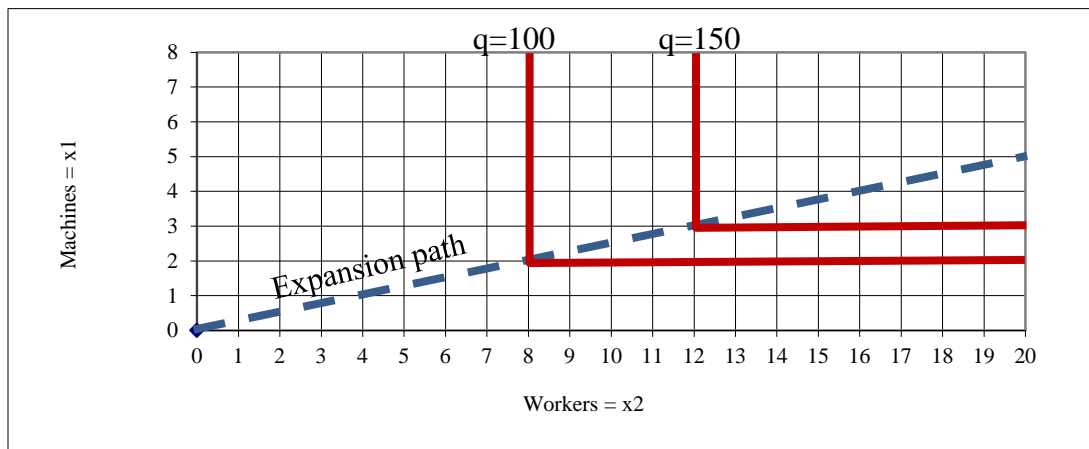
- (1)d. (2)b. (3)d. (4)c. (5)a. (6)b. (7)a. (8)b. (9)b. (10)b.  
 (11)c. (12)b. (13)c.

#### II. Short answer

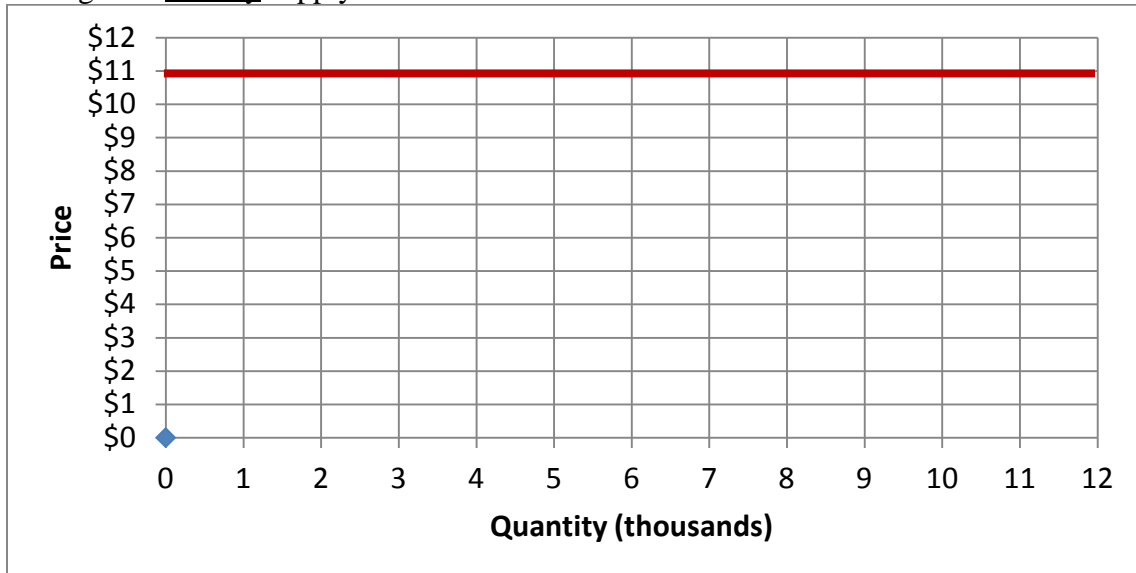
- |     |                       |                    |                            |
|-----|-----------------------|--------------------|----------------------------|
| (1) | a. 1.6 % .            | b. 0.9 % .         |                            |
| (2) | a. 900 units.         | b. 700 units.      | c. zero units (shut down). |
|     | d. \$8 = min SATC.    | e. \$4 = min SAVC. |                            |
| (3) | a. \$5.               | b. 6 thousand.     | c. excess demand.          |
|     | d. 3 thousand pounds. | e. decrease.       | f. \$7 thousand.           |
|     | g. increase.          | h. \$4 thousand.   | i. \$3 thousand.           |

#### III. Problems

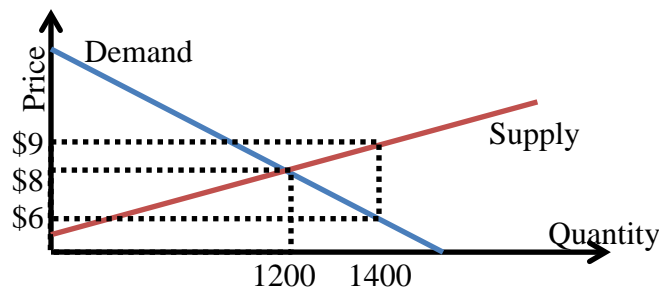
- (1) a.  $MP_1 = 6 x_1^{-1/4} x_2^{1/2}$ . YES, there are diminishing returns to input 1, because as  $x_1$  increases (and  $x_2$  is held constant),  $MP_1$  decreases.  
 b.  $MRSP = MP_2/MP_1 = \frac{4 x_1^{3/4} x_2^{-1/2}}{6 x_1^{-1/4} x_2^{1/2}} = \frac{2 x_1}{3 x_2}$ . YES, this function has diminishing MRSP, because as  $x_1$  decreases and  $x_2$  increases, MRSP diminishes.  
 c. Check returns to scale:  
 $f(ax_1, ax_2) = 8 (ax_1)^{3/4} (ax_2)^{1/2} = a^{3/4} a^{1/2} 8 x_1^{3/4} x_2^{1/2} = a^{5/4} q > aq$ , for  $a > 1$ .  
 This function has INCREASING returns to scale.
- (2) a.  $x_1 = (x_2/4)$ .      b.  $q = 50 x_1$ .      c.  $q = 50 (x_2/4)$ .  
 d.  $q = \min\{50 x_1, 50 (x_2/4)\}$ ,  
 e.



- (3) a.  $120 = 2 x_1 x_2$ , or  $60 = x_1 x_2$ .  
 b.  $MRSP = MP_2/MP_1 = \frac{2x_1}{2x_2} = x_1/x_2$ .  
 c. Set  $MRSP = \$20/\$75$  and solve jointly with  $60 = x_1 x_2$ , to get  $x_1^*=4$  and  $x_2^*=15$ .  
 d.  $TC(120) = 4 \times \$75 + 15 \times \$20 = \$600$ .
- (4) a.  $AC = TC/q = 0.01 q^2 - 0.4 q + 15$ . Set  $0 = dAC/dq = 0.02q - 0.4$  and solve to get  $q_{ES} = 20$ .  
 b. Breakeven price = minimum  $AC = AC(q_{ES}) = \$11$ .  
 c. Firm's supply curve is as follows.  
 If  $P > \$11$ ,  $P = MC(q) = dTC/dq = 0.03q^2 - 0.8q + 15$ .  
 If  $P < \$11$ ,  $q=0$  (firm shuts down).  
 d. Long-run industry supply curve is a horizontal line at minimum  $AC$ :



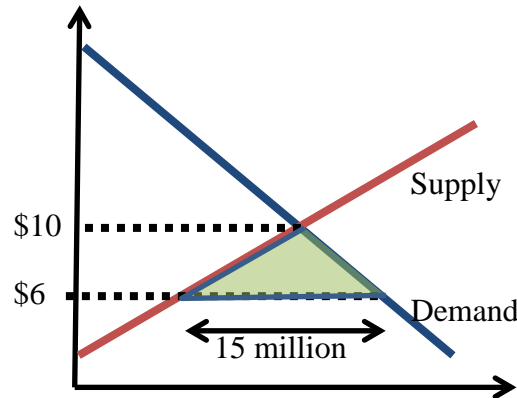
- (5) a. Set  $P_D = P_S$  and solve to get  $Q^*=1200$  and  $P^*=P_D=P_S=\$8$ .  
 b. Set  $P_D + \$3 = P_S$  and solve to get  $Q_{SUB} = 1400$ . Incidentally,  $P_D = \$6$ ,  $P_S = \$9$ .



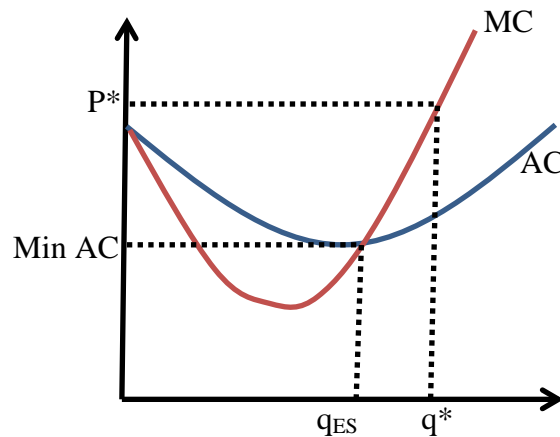
- c. Consumer surplus increases by \$2600, the area of the lower trapezoid.  
 d. Producer surplus increases by \$1300, the area of the upper trapezoid.  
 e. The country as a whole loses because the government must pay  $\$3 \times 1400 = \$4200$  for the subsidy program. The deadweight loss is \$300.

**IV. Critical thinking**

(1) Welfare **increases by \$30 million**. Graph should show domestic demand and domestic supply intersecting at a price of \$10. At a price of \$6, quantity demanded is 15 million more than quantity supplied; this difference is imported. The area of the triangle of welfare gain is therefore \$30 million. (With the information given, it is not possible to compute separately the gain in consumer surplus or the loss of producer surplus.)



(2) One should **disagree** with this statement. The correct rule for maximizing profit **depends on the market price ( $P^*$ )** as follows. Produce output up to the point where **marginal cost equals price**, provided price is greater than or equal to minimum average cost. If price is less than minimum average cost, shut down. In almost all cases, this rule implies producing an output level ( $q^*$ ) greater than the minimum point on the average cost curve (the so-called “efficient scale,”  $q_{ES}$ ).



**Version B**

**I. Multiple choice**

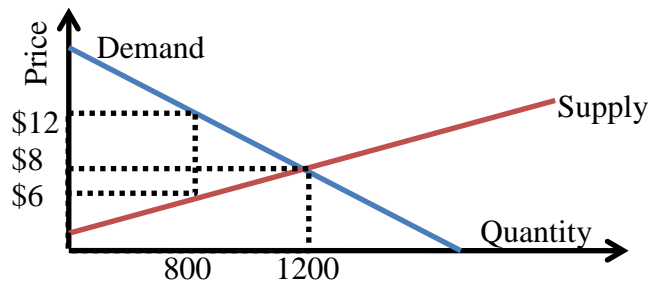
- (1)b. (2)c. (3)b. (4)a. (5)b. (6)c. (7)c. (8)c. (9)c. (10)c.  
 (11)d. (12)a. (13)d.

**II. Short answer**





- (5) a. Set  $P_D = P_S$  and solve to get  $Q^*=1200$  and  $P^*=P_D=P_S=\$8$ .  
 b. Set  $P_D = P_S + \$6$  and solve to get  $Q_{TAX} = 800$ . Incidentally,  $P_D = \$12$ ,  $P_S = \$6$ .



- c. Consumer surplus decreases by \$4000, the area of the higher trapezoid.  
 d. Producer surplus decreases by \$2000, the area of the lower trapezoid.  
 e. The country as a whole loses even though the government collects  $\$6 \times 800 = \$4800$  in tax revenue. The deadweight loss is \$1200.

**IV. Critical thinking**  
 Same as Version A.

[end of answer key]