ECO 601 — Problem Set # 9 KEY — Fall 2003

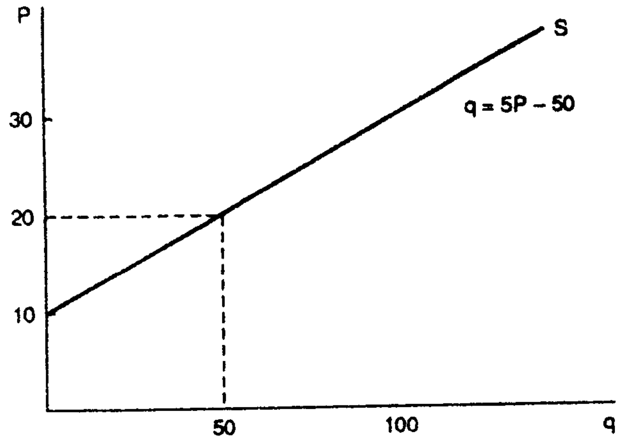
1\. 13.1 a. $MC = \partial TC/\partial q = .2q + 10$

set $MC = P = 20$

yields $q^* = 50$

b. $\pi = Pq - TC = 1000 - 800 = 200$

c.



2\. $\pi(q) = R(q) - C(q)$

(a) Lump sum tax T $\quad \pi(q) = R(q) - C(q) - T$

$$\frac{\partial \pi}{\partial q} = \frac{\partial R}{\partial q} - \frac{\partial C}{\partial q} - 0 = 0$$

$MR = MC$, no change, as long as $T \leq \$200$ per day.

Proportional tax $\quad \pi(q) = (1 - t)(R - C)$, where $t = .50$.

$$\frac{\partial \pi}{\partial q} = (1 - t)(MR - MC) = 0,$$

$MR = MC$, no change

Tax per unit $\quad \pi(q) = R(q) - C(q) - tq$, where $t = 2$

$$\frac{\partial \pi}{\partial q} = MR - MC - t = 0$$

$\therefore MR = MC + t$, $\quad q$ is changed—per unit tax does affect output:

$20 = .2q + 10 + 2$

$.2q + 12 = 20$

$q = 40$, so he will work less this way.

3\. 14.8 a. $TC = wq^2 - 10q + 100.$

If $w = \$1$, $TC = q^2 - 10q + 100.$

$MC = 2q - 10 \qquad AC = q - 10 + \dfrac{100}{q}$

In the long run, $AC = MC$

$2q - 10 = q - 10 + \dfrac{100}{q}$, $q^2 = 100$, $q = 10$

= output for typical mushroom producer.

b. Constant costs industry means that as new firms enter this low point of average, total cost remains unchanged, resulting in a horizontal supply curve at $P = \$10$ (when $q = 10$, $AC = \$10$). Thus, long-run equilibrium $P = \$10$ and $Q = -1{,}000(10) + 40{,}000 = 30{,}000$. There will be

$\dfrac{30{,}000}{10} = 3{,}000$ firms.

c. If $w = \$4 \qquad TC = 4q^2 - 10q + 100$

$MC = 8q - 10 \qquad AC = 4q - 10 + \dfrac{100}{q}.$

In the long run $\quad AC = MC$

$8q - 10 = 4q - 10 + \dfrac{100}{q}$, $q^2 = 25$, $q = 5.$

Long-run equilibrium price = low point of AC,

$AC = 4q - 10 + \dfrac{100}{q} = 20 - 10 + 20 = \$30$

Thus, $Q = -1{,}000(30) + 40{,}000 = 10{,}000.$

There will be $\dfrac{10{,}000}{5} = 2{,}000$ firms.

4\. See KEY to Fall 1999 2nd Test.