SOLUTIONS PROBLEM SET 11

① a) $1000-10P = 10+200P \Rightarrow P^* = 4.7 \quad Q^* = 1000-10(4.7) = 953$

b) Calculate e_S and e_D:

$$e_D = \frac{dQ^D}{dP}\frac{P}{Q^D} = -10\left(\frac{4.7}{953}\right) = -.05$$

$$e_S = \frac{dQ^S}{dP}\frac{P}{Q^S} = 200\left(\frac{4.7}{953}\right) = .99$$

Use the pass-through formula:

$$\frac{dP^D}{dt} = \frac{e_S}{e_S+|e_D|} = \frac{.99}{.99+.05} = .95$$

$$\frac{dP^S}{dt} = \frac{|e_D|}{e_S+|e_D|} = \frac{.05}{.99+.05} = .05$$

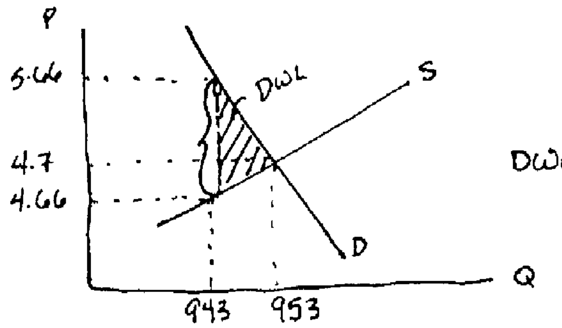
$\Rightarrow$ consumers bear 95% of the tax burden and producers bear 5%

c) Equilibrium occurs where $D(P^D) = S(P^S)$, or $D(P^D) = S(P^D-1)$ since $P^S = P^D - \text{tax}$. or, w/ different notation, $Q^D(P^D) = Q^S(P^S)$

$$1000-10P^D = 10+200(P^D-1) \Rightarrow P^D = 5.66,\ P^S = 4.66$$

The price paid by consumers increases by 96 cents and the price received by sellers has gone down 4 cents. Yes, this is what was predicted above (with .01 difference, due to rounding). The new equilibrium quantity is $1000-10(5.66) \approx 943$

d)



$$DWL = \frac{1}{2}(1)(10) = 5$$

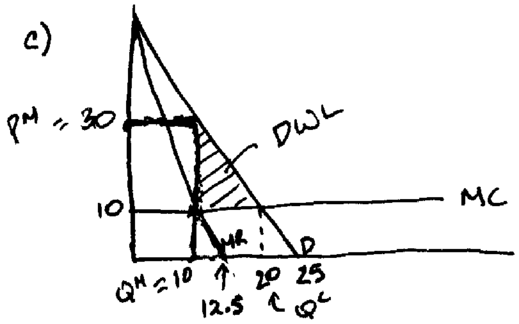
② a) $\Pi = (50-2Q)Q - 10Q$

$d\Pi/dQ = 50 - 4Q - 10 = 0 \Rightarrow Q^M = 10 \quad P^M = 50 - 2(10) = 30$

$\Pi^M = (30-10)10 = 200$

b) Find Q where P=MC : $50 - 2Q = 10 \Rightarrow Q^c = 20$

c)



d) DWL area
$= \frac{1}{2}(10)(20) = 100$

e) $\Pi = (50 - 2Q + S)Q - 10Q$

$\frac{d\Pi}{dQ} = 50 - 4Q + S - 10 = 0 \Rightarrow Q^M = \frac{40+S}{4}$, so if the government wants the monopolist to produce $Q^M = 20 = Q^c \Rightarrow$

$\frac{40+S}{4} = 20 \Rightarrow S = 40$

③ a) A lump sum subsidy would not affect anything at the margin ⇒ monopolist's profit-maximizing output would not be affected.

b) $\Pi = P(Q)Q + SQ - C(Q)$

$\frac{d\Pi}{dQ} = P(Q) + Q\frac{dP(Q)}{dQ} + S - \frac{dC(Q)}{dQ} = 0$ F.O.C.

Since $P(Q)$ will be equal to the competitive price, which in turn is equal to $\frac{dC(Q)}{dQ}$ (marginal cost), the FOC becomes simply $Q\frac{dP(Q)}{dQ} + S = 0$

$\Rightarrow S = -Q\frac{dP(Q)}{dQ}$

Dividing both sides by the competitive price, $P^c \Rightarrow$

$S/P^c = -Q/P^c \, \frac{dP(Q)}{dQ} = \frac{1}{|\epsilon_{Q,P}|}$

- Recall that the Lerner index has $\frac{P-MC}{P} = \frac{1}{|\epsilon_{Q,P}|}$
In order to provide the monopolist with the incentive to produce the efficient output level and charge the competitive price = MC, the firm must receive a markup over marginal cost equal to S, making the price cost margin equal to $\frac{1}{|\epsilon_{Q,P}|}$