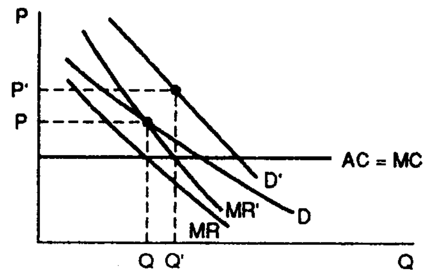
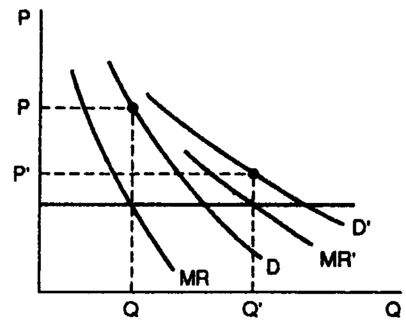
ECO 601 Problem Set #10 KEY Fall 2003

1. 18.4 a.



(case 1)



(case 2)

b. No supply curve for monopoly; have to examine $MR = MC$ intersection since a shift in demand is accompanied by a shift in MR curve. Case (1) and case (2) above show that P may rise or fall in response to an increase in demand.

c. Can use inverse elasticity rule to examine this

$$-e = \frac{P}{P - MC} = \frac{P}{P - MR}.$$

As −e ↓ toward 1, $P - MR$ increases.

Case 1 MC constant, MR constant

If −e ↓ , P − MR ↑, P ↑.

If −e constant, $P - MR$ constant, P constant.

If −e ↑, P − MR ↓, P ↓.

Case 2 MC falling, MR falls:

If −e ↓, $P - MR$ ↑, MR ↓, P may rise or fall.

If −e constant, $P - MR$ constant. MR ↓, P ↓.

If −e ↑, $P - MR$ ↓, MR ↓, P ↓.

Case 3 MC rising, MR rising

If −e ↑, $P - MR$ ↑, MR ↑, P ↑.

If −e constant, $P - MR$ constant, MR ↑, P ↑.

If −e ↑, $P - MR$ ↓, MR ↑, P may rise or fall.

2. **11.4.** a) If demand is given by $P = 300 - Q$, then $MR = 300 - 2Q$. To find the optimum set $MR = MC$,

$$300 - 2Q = Q$$
$$Q = 100.$$

At $Q = 100$, price will be $P = 300 - 100 = 200$. At this price and quantity, total revenue will be $TR = 200(100) = 20{,}000$ and total cost will be $TC = 1200 + 0.5(100)^2 = 6{,}200$. Therefore, the firm will earn a profit of $\pi = TR - TC = 13{,}800$.

b) The price elasticity at the profit-maximizing price is

$$\epsilon_{Q,P} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}.$$

With the demand curve $Q = 300 - P$, $\Delta Q/\Delta P = -1$. Therefore, at the profit-maximizing price

$$\epsilon_{Q,P} = -1\left(\frac{200}{100}\right)$$
$$\epsilon_{Q,P} = -2.$$

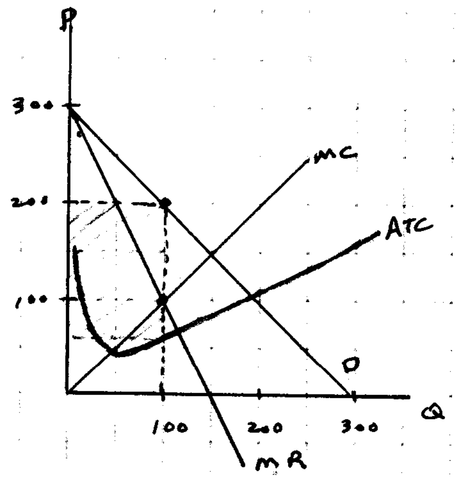
The marginal cost at the profit-maximizing output is $MC = Q = 100$. The inverse elasticity pricing rule states that at the profit-maximizing price and quantity

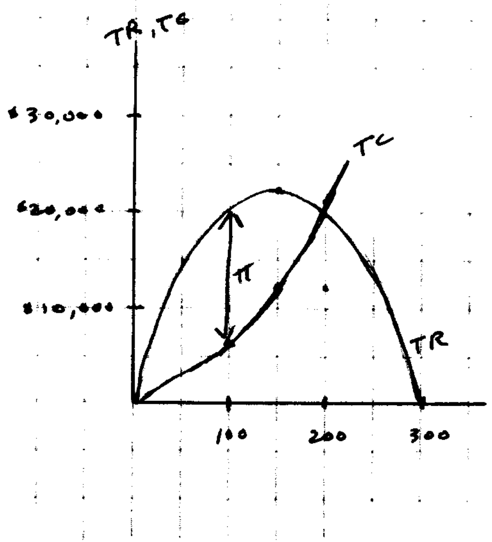
$$\frac{P - MC}{P} = -\frac{1}{\epsilon_{Q,P}}.$$

In this case we have

$$\frac{200 - 100}{200} = -\frac{1}{-2}$$
$$\frac{1}{2} = \frac{1}{2}.$$

Thus, the IEPR holds for this monopolist.





3. See Answer Key to Problem Set #10, Fall 2002.

4. 21.6 a.

$$RTS\ (L \text{ for } K) = \frac{MP_L}{MP_K} = \frac{\frac{1}{2}\left(\frac{K}{L}\right)^{112}}{\frac{1}{2}\left(\frac{L}{K}\right)^{112}} = \frac{K}{L}$$

Since $w = v = \$1$, $\frac{K}{L} = \frac{w}{v} = \frac{1}{1}$, so K and L will be used in a one-to-one ratio.

$TC = L \cdot w + K \cdot v = L + K = 2L$, so

$$AC = \frac{2L}{q} = \frac{2L}{\sqrt{KL}} = \frac{2L}{\sqrt{LL}} = 2 \text{ and } MC = 2\ .$$

b. $MC = P = 2$ so $Q = 400{,}000 - 100{,}000(2) = 200{,}000$ pipe

$$q = \frac{200{,}000 \text{ pipe}}{1{,}000 \text{ firms}} = 200 \text{ pipe/firm}$$

$q = 200 = \sqrt{L \cdot K} = L$, so 200 workers are hired per firm, 200,000 by the industry.

c. $w = \$2$, $v = \$1$, so $K/L = 2$

$$TC = wL + vK$$
$$= 2L + K = 4L = 2\sqrt{2}\, q$$

so $AC = MC = 2\sqrt{2}$.

d. $P = 2\sqrt{2}$ $\quad Q = 400{,}000 - 100{,}000(2\sqrt{2}) = 117{,}157$

$$L = \frac{117{,}157}{\sqrt{2}} = 83{,}000 \text{ workers hired by the industry.}$$

e. If $Q = 200{,}000$ at the new wage, $L = \frac{200{,}000}{2}$

141,000 workers would have been hired by the industry.

So if Q were unchanged, 59,000 fewer workers would have been hired = substitution effect.
The remaining 58,000 fewer workers are the result of the lower output = output effect. As is usual in the Cobb-Douglas case, the effects are of approximately equal size.

5.

21.9 $w_m^2 = \frac{L_m}{9}$ $w_m L_m = \frac{L_m^{3/2}}{3}$

$$ME_L = \frac{L_m^{1/2}}{2} = MRP_L = (2)(5) = 10 \quad \therefore L_m = 400, \; w_m = \frac{20}{3}$$

$$w_f = \frac{L_f}{100} \qquad w_f L_f = \frac{L_f^2}{100}$$

$$ME_L = \frac{L_f}{50} = 10 \qquad \therefore L_f = 500, \; w_f = 5 \qquad L_T = 900$$

per hour on machinery = 9000 − 5(500) − 6.66(400) = 3833.

If same wage for men and women $w = MRP_L = 10$, $\therefore L = 1000 + 900 + 1900$
per hour now = 1900(10) − 10(1000) − 10(900) = 0.