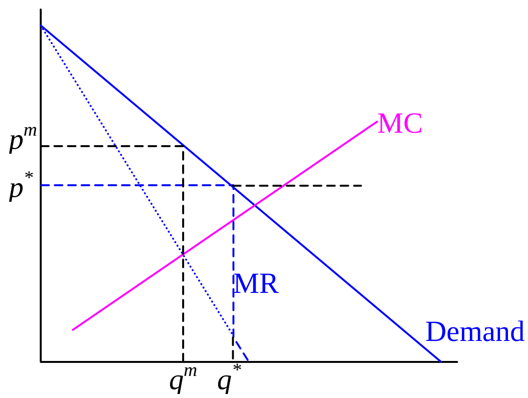
Economics 370
Microeconomic Theory
Problem Set 6
Answer Key

1) *Describe the effects on output and welfare if the government regulates a monopoly so that it may not charge a price above p, which lies between the unregulated monopoly price and the optimally regulate price (determined by the intersection of the firm's marginal cost and the market demand curve).*

As usual, the monopoly determines its optimal output on the basis of MR = MC.
Here, however, it cannot charge a price in excess of p^*. So, for any output less than Q(p^*) (where Q(p) is the demand function) its marginal revenue is p^*. On the graph below that gives:



2) *The inverse demand curve a monopoly faces is $p=10Q^{-1/2}$. The firm's cost curve is c(Q) = 10 + 5Q. Find the profit maximizing price and quantity, and economic profit for the monopoly.*

Revenue = pQ = Q($10Q^{-1/2}$) = $10Q^{1/2}$
MR = $5Q^{-1/2}$

MC = 5

Profit maximization implies MR = MC, so
$5Q^{-1/2}$ = 5, or Q* = 1; p* = 10.

Economic Profit = Revenue – Cost = Q × p – c(Q) = 1(10) – (10 + 5Q)
Economic Profit = 10 – 15 = -5.
So, the monopoly will not produce at all, and will have a profit of zero.

3) *The inverse demand curve a monopoly faces is p = 100 – Q.*
Find the profit maximizing price and quantity, and economic profit if:

a) *The total cost curve is c(Q) = 10 + 5Q.*

p = 100 – Q, R = p × Q = (100 – Q) × Q, so MR = 100 – 2Q.

C(Q) = 10 + 5Q, therefore MC = 5.

The profit-maximizing rule is MR = MC.
100 – 2Q = 5 $\Rightarrow$ Q^* = 47.5, p^* = 100 – Q^* = 52.5

So the profit-maximizing quantity is 47.5 units. The firm will charge \$52.5 per unit.

Economic Profit = Revenue – Cost = $Q \times p - c(Q) = Q(100 - Q) - (10 + 5Q)$
Economic Profit = $47.5(52.5) - (10 + 5(47.5))$ = \$2,246.25

b) *The total cost curve is $c(Q) = 100 + 5Q$. How is this similar/different from that found in part a?*

The optimal price and quantity are the same, because the marginal cost doesn't change. The marginal cost is constant at \$5 as before. By setting MR = MC, the firm will have the same profit-maximizing solution. The only thing that changes is economic profit.

Economic profit here is \$90 less than in the previous problem (because of the difference in fixed costs).
So, Economic Profit = \$2,246.25 – 90 = \$2,156.25.

c) *If the total cost curve is given by $c(Q) = 16 + Q^2$.*

$C(Q) = 16 + Q^2$, therefore $MC = 2Q$.

The profit-maximizing rule is MR = MC.
$100 - 2Q = 2Q \Rightarrow Q^* = 25,\ p^* = 100 - Q^* = 75$

So the profit-maximizing quantity is 25 units. The firm will charge \$75 per unit.
Economic Profit = Revenue – Cost = $Q \times p - c(Q) = 25(75) - (16 + Q^2)$ = \$1234.

d) *If the (total) cost curve is given by $c(Q) = 16 + 4Q^2$, find the monopolist's profit-maximizing quantity and price. How much economic profit will the monopolist earn?*

$C(Q) = 16 + 4Q^2$, therefore $MC = 8Q$.

The profit-maximizing rule is MR = MC.
$100 - 2Q = 8Q \Rightarrow Q^* = 10,\ p^* = 100 - Q^* = 90$

So the profit-maximizing quantity is 10 units. The firm will charge \$90 per unit.
Economic Profit = Revenue – Cost = $Q \times p - c(Q) = 10(90) - (16 + 4Q^2)$ = \$484.

e) *Suppose (again) that the total cost curve is given by $c(Q) = 16 + Q^2$ and the monopolist has access to a foreign market in which it can sell whatever quantity it chooses at a constant price of 60. How much will it sell in the foreign market? What will its new quantity and price be in the original market?*

It will sell on the foreign market up to the point where its marginal cost = 60.

Since Marginal Cost = 2Q that means **total** production is $2Q^T = 60$ or $Q^T = 30$.

Domestic sales are now based on the marginal cost of \$60 per unit, so
The profit-maximizing rule is MR = MC.
$100 - 2Q = 60 \Rightarrow Q^D = 20,\ p^D = 100 - Q^D = 80$

It will sell the remainder on the foreign market: $Q^F = 30 - 20 = 10$ units.

f) *Finally suppose the monopolist has a long-run constant marginal cost curve of MC = 20. Find the monopolist's profit-maximizing quantity and price. Find the efficiency loss from this monopoly.*

$MR = 100 – 2Q$.

The profit-maximizing rule is MR = MC.
$100 – 2Q = 20 \Rightarrow Q^* = 40$, $p^* = 100 – Q^* = 60$

So the profit-maximizing quantity is 40 units. The firm will charge $60 per unit.

Efficient production and price are: $p^e = 20$; $Q^e = 80$.

Then Dead-Weight-Loss = ½ (60 – 20) (80 – 40) = $800.

4) *A monopoly sells its good in the United States, where the elasticity of demand is –2, and in Japan, where the elasticity of demand is –5. Its marginal cost is $10.*

a) *At what price does the monopoly sell its good in each country if resales are impossible?*

The price-discriminating monopoly maximizes its profit by operating where its marginal revenue for each country equals the firm’s marginal cost. Hence, the marginal revenues for the two countries are equal; $MR_{US} = MC = MR_{J.}$

$MR_{US} = P_{US} (1 + 1/\varepsilon_{US}) = MC$. $P_{US} (1 – 1/2) = 10$. Therefore, $P_{US} =20$.

$MR_J = P_J (1 + 1/\varepsilon_J) = MC$. $P_J (1 - 1/5) = 10$. Therefore, $P_J =12.5$.

b) *What happens to the prices that the monopoly charges in the two countries if retailers can buy the good in Japan and ship it to the United States at a cost of (a) $10 or (b) $0 per unit?*

If retailers can buy the good in Japan and ship it to the United States at a cost of $10, then it can sell the good in the United States at the price of $22.50. Since it is not profitable, it never happens and nothing changes. However, if the shipping cost is zero, retailers can buy the good in Japan for $12.50 and sell it in the United States for $19 for a profit and undercut the monopolist. This means the monopoly cannot price-discriminate any more. As a result, there will be a single common price which will be somewhere between $12.5 and $ 20.

5) *A monopoly sells in two countries, and resales between the countries are impossible. The demand curves in the two countries are $p_1=100 – Q_1$, $p_2=120 – 2Q_2$. The monopoly’s marginal cost is $m = 30$. Solve for the equilibrium price in each country.*

The price-discriminating monopoly maximizes its profit by operating where its marginal revenue for each country equals the firm’s marginal cost. Hence, the marginal revenues for the two countries are equal; $MR_1 = MC = MR_{2.}$

$P_1 = 100 – Q_1$
$MR_1 = 100 – 2Q_1$, $MC = 30$
Since $MR_1 = MC$, $Q_1^*=35$. Therefore, $P_1^* = 65$.

$P_2 = 120 – 2Q_2$
$MR_2 = 120 – 4Q_2$, $MC = 30$.
Similarly, $MR_2 = MC$. Therefore, $MQ_2^*=22.5$ and $P_1^* = 75$.