Problem set # 1

1) In perfect competition the equilibrium is such that price = marginal cost; hence the equilibrium price is $p^* = 2$. Using the inverse demand function we know that in equilibrium quantity is $Q^* = 8$.

2) Consumer surplus is given by $(10-2)^*(8)/2 = 32$.

3) Firm's revenues are $10 * 250 = 2500$. The total variable cost a firm bears to produce 10 units is $2(10)^2 = 200$. The producer surplus is the difference between revenues and the minimum amount of money a firms is willing to accept to produce the same output, i.e. it total avoidable costs; therefore producer surplus is: $2500 - 200 = 2300$. The produces surplus does not change if the cost function is $C = 2Q^2 + 20$, because we have just added a fixed cost that does not affect the firm's supply curve.
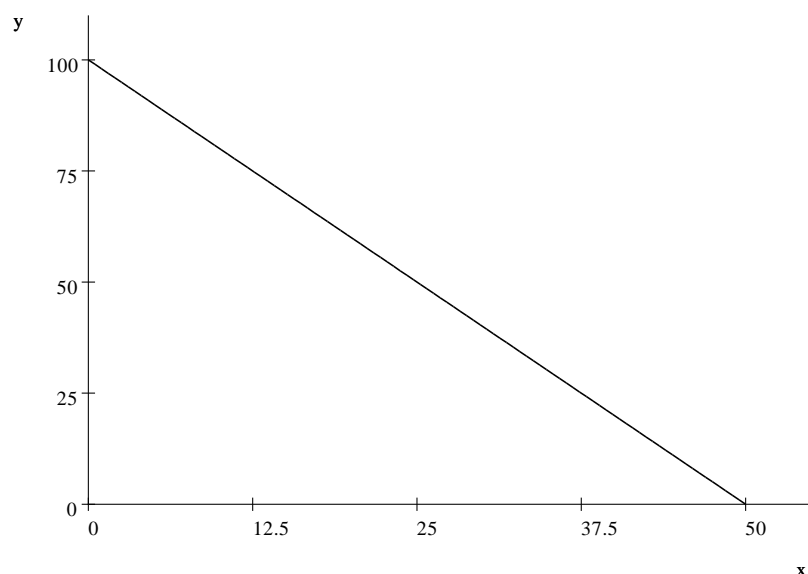
Multiple choice questions
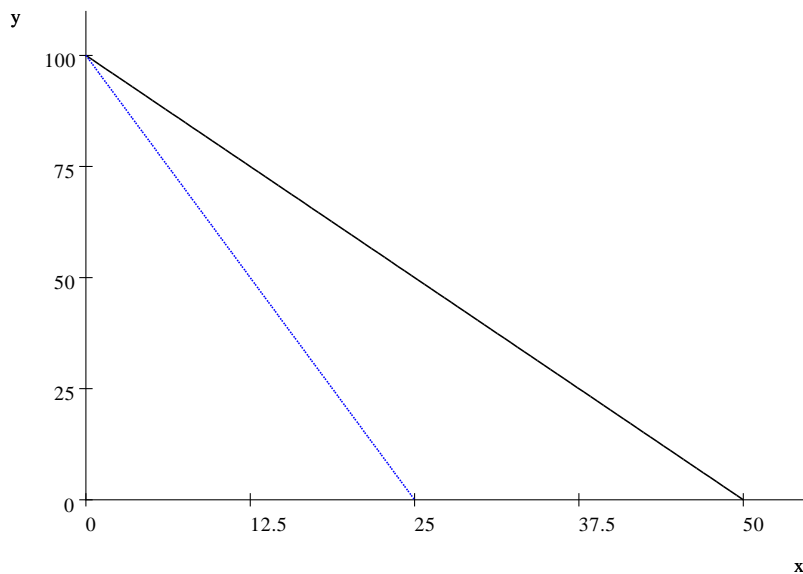
1) – C

2) – B

3) – C

4) – A

5) – D

Problem set # 2

1) the demand curve is

The revenue function is $R = Q (100 - 2Q)$. Its derivative is $100 - 2Q - 2Q = 100 - 4Q$; this is the marginal revenue curve and it is depicted as the blue line in the diagram below.

2) A monopoly maximizes profits by equating marginal revenue and marginal cost. Hence the optimal quantity is found by solving this equation:

$100 - 4Q = 16$ ➔ $Q^m = 21$

The equilibrium price is $p^m = 100 - 2(21) = 58$

3) if the same market is perfectly competitive the equilibrium is $100 - 2Q = 16$, which means that the equilibrium output is 42; the equilibrium price, of course, will be $p^c = 16$.

4) In the monopolized market the consumer surplus is $(100 - 58) * (21)/2 = 441$. The monopolist's surplus is $(p^m - c)Q^m = (58 - 16) * 21 = 882$; so total welfare is 1323; in the competitive market consumer surplus is $(100 - 16) * 42/2 = 1764$ and this is also the social welfare since firms do not get any surplus. The deadweight loss is $1764 - 1323 = 441$

Multiple choice questions

1) – D

2) – A

3) – C

4) – C

5) – A

6) - D

7) - A

Problem set # 3

1) A monopolist that is able to perfectly price discriminate will charge any consumer his reservation price; so the marginal consumer that is served is the consumer that is willing to pay a price equal to the marginal

cost of production; this implies that the total output is found solving the following equation $90 - Q = 30$; the solution is $Q = 60$. Through price discrimination the entire consumer surplus is transferred to the monopolist so that to compute the firm's profit we need to compute the consumer surplus first. This is given by $(90 - 30) * 60/2 = 1800$. Since marginal cost is constant there are no other profits to be added and so the monopolist's profit is 1800. Consumer surplus is zero by definition and therefore total surplus is 1800. There is no deadweight loss because all consumers that have a willingness to pay above the cost of serving them are allowed to buy and consume the product.

If the monopolist cannot price discriminate it will maximize its profit by charging a single price. Its profit function is $\pi^m = p*(90 - p) - 30*(90 - p) = 90p - p^2 - 2700 + 30p = 120p - p^2 - 2700$; the FOC $(\partial\pi^m/\partial p = 0)$ is $120 - 2p = 0$; so that the monopolist's price is $p^m = 60$ and the equilibrium quantity is $Q^m = 30$. Consumer surplus becomes $(90 - 60) *30/2 = 450$; the monopolist's profit is $120*60 - 60^2 - 2700 = 900$ and total surplus is $450 + 900 = 1350$. The deadweight loss is $1800 - 1350 = 450$.

2) The monopolist considers the two markets separately and solves two distinct maximization problems. In the Italian market the profit function is $\pi_I = (100 - Q_I) Q_I - 20*(Q_I) = 80 Q_I - Q_I^2$; the FOC is $80 - 2Q_I = 0$ that has as solution $Q_I = 40$; the price charged in Italy is $p_I = 100 - Q_I = 100 - 40 = 60$. In the French market the profit function is $\pi_F = (80 - 2Q_F)Q_F - 20*(Q_F) = 60Q_F - 2Q_F^2$; the FOC is $60 - 4Q_F = 0$ and its solution is $Q_F = 15$; the price charged in France is $p_F = 80 - 2Q_F = 80 - 30 = 50$.

Multiple choice questions

1) – C

2) – C

3) – D

4) – B

5) False. This is only the case if all consumers are identical. If consumers differ, no single price can capture all the consumer surplus.

Problem set # 4

To maximize profit, the monopoly must set marginal revenue $MR (= \partial R/\partial Q)$ equal to marginal cost, MC and must set the marginal revenue of advertising, $MR_A (= \partial Q/\partial A)$ equal to the marginal cost of advertising, which is 1. $R = pQ = 100Q - Q^2 + 5A - A^2$. Setting $MR = MC$ yields $100 - 2Q = 10$ or $Q = 45$. Setting $MR_A = 1$ yields $5 - 2A = 1$ or $A = 2$

Multiple choice questions

1) – C

2) – B

3) – D

4) True. They do so because they have to balance the benefit of paying less with the cost of not getting the good

5) - B

6) - C

Problem set # 5

Firm 1 profit function is $\pi_1 = (100 - q_1 - q_2)q_1 - 10q_1 = 90q_1 - q^2_1 - q_1q_2$. The best response function for this firm is given by the FOC ($\partial\pi_1/\partial q_1 = 0$), that is $90 - 2q_1 - q_2 = 0$; since firms are symmetric we know that in equilibrium $q_1 = q_2 = q^*$; so we can write $90 - 3q^* = 0$ which yields $q^* = 30$. Both firms will produce and sell 30 units each so that the overall output is 60; the equilibrium price is $p^* = 100 - 60 = 40$. In equilibrium consumer surplus is $(100 - 40)*60/2 = 1800$.

Multiple choice questions

1) –A

2) – B

3) – A

4) – B

5) – D