MBA Maths
Practice Quiz 4 2009 Solution

Question 1

(a) The quantity demanded Q is a linear function of price. When price P=0 the demand is 80. When price P=40 the demand is zero. Give an equation for the quantity Q in terms of price P you should have Q on the left and an expression of the form b+mP on the right

$m = -80/40 = -2$; $b = 80$; $Q=80-2P$

(b) The quantity supplied S is zero if the price is less or equal to than the unit cost of $1.10. For every extra 30 cents above this, the quantity supplied rises by 1.8 units. Give an equation for the quantity supplied S in terms of price P. You should have S on the left and an expression of the form b+mP on the right.

$m = 1.8/0.30 = 6$; $0 = b + 6.(1.10)$; $b = -6.6$; $S = 6P - 6.6$

Question 2

Sketch the following functions

a. $-2x^2+2x+4$
b. $2x^2+6x+5$
c. $4x-1-4x^2$

On each graph indicate the following

(i) The point/s at which the function crosses the x-axis

This is asking us to solve the function by equating it to zero.

(a) we can factorise to give $-2(x-2)(x+1) = 0$.

When x=2 or x=-1 the function is zero, hence the function crosses the x-axis as these points

(b) This doesn't factorise and doesn't have any real roots at all where the function is zero. That is because in the formula for solving a quadratic equation, $(b^2 – 4ac) = (6^2 – 4.2.5)$ is negative, and we cannot find square root of a negative number. We do not want to go into a discussion of imaginary roots!! Let us leave it to the mathematicians.

(c) $4x - 1 - 4x^2 = 0$; $4x^2 - 4x + 1 = 0$. $(2x - 1)^2 = 0$. Thus x=1/2

(ii) The point at which the function crosses the y-axis.

Here we just need to set x to zero.

(a) 4 (b) 5 (c) - 1

(iii) The value of x which minimizes or maximizes the function.

For a quadratic function, a maximum is obtained when x = - b/2a

(a) a = - 2, b = 2 ; hence x = -2/2.-2 = ½ and since a is negative, x=1/2 gives us the maximum

(b) a = 2, b = 6 ; hence x = -6/2.2 = - 3/2 and since a is positive, x= - 3/2 gives us the minimum

© a = - 4, b = 4 ; hence x = -4/2.-4 = ½ and since a is negative, x=1/2 gives us the maximum

(iv) The minimum/maximum value of the function

Here we set x to be the value we calculated above back into the original equation:

(a) Maximum = $- 2(1/2)^2 + 2(1/2) + 4 = -1/2 + 1 + 4 = 4$ ½

(b) Minimum = $2(- 3/2)^2 + 6(- 3/2) + 5 = 9/2 - 9 + 5 =$ ½

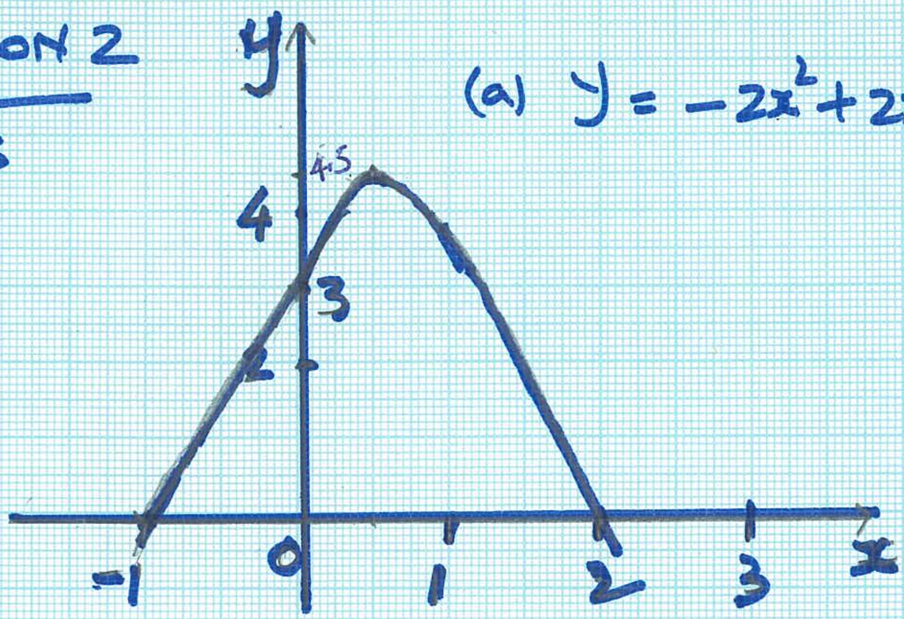
(c) Maximum = $4(1/2) - 1 - 4(1/2)^2 = 2 - 1 - 1 = 0$

PRACTICE QUIZ 4

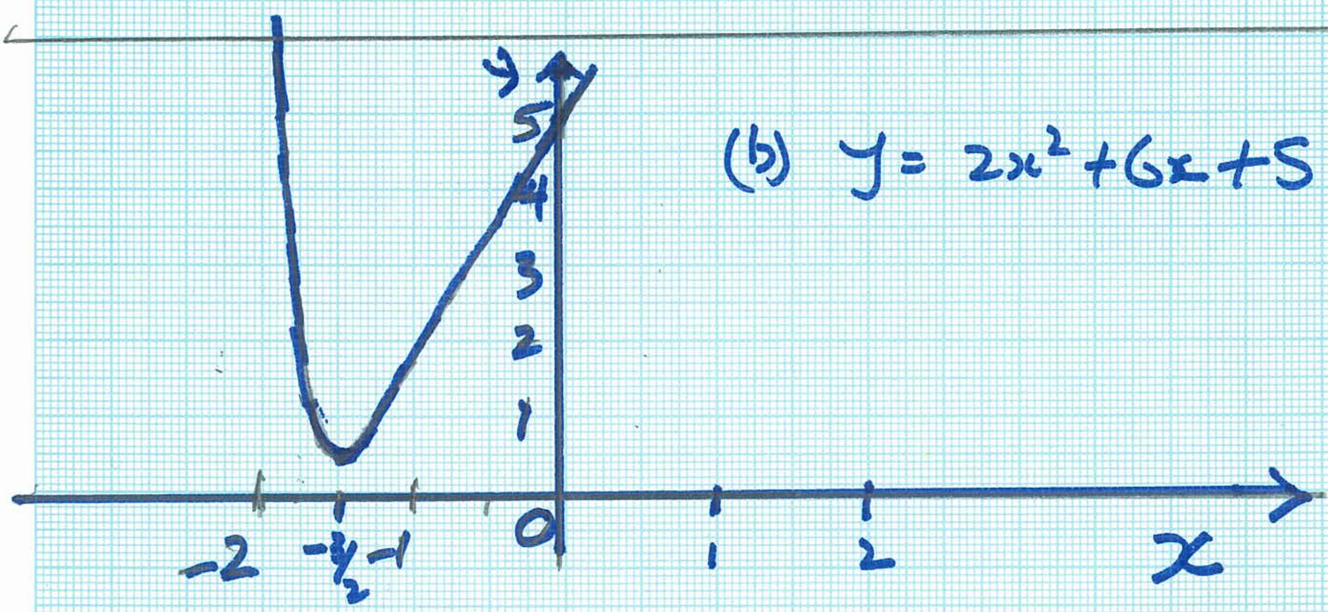
QUESTION 2

GRAPHS

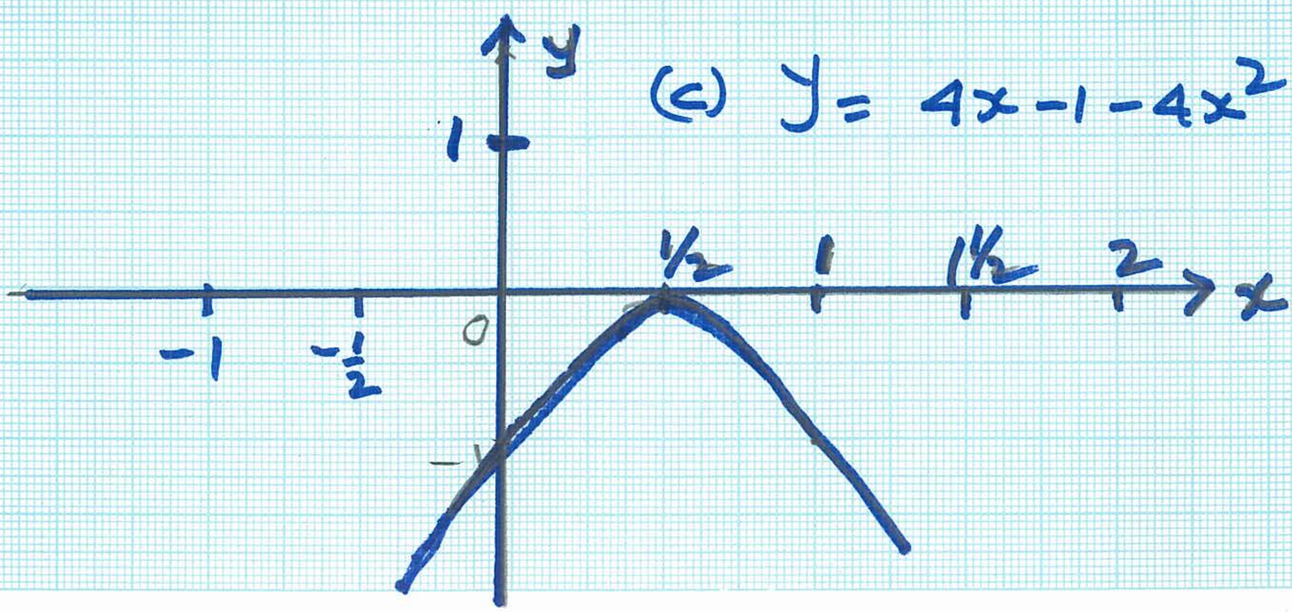
(a) $y = -2x^2 + 2x + 4$



(b) $y = 2x^2 + 6x + 5$



(c) $y = 4x - 1 - 4x^2$



NAME: ....

STUDENT No.: ....

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Question 3

Suppose you are given the following information about the monthly demand for widgets.

- If the price is \$0, the demand for widgets will be 115,000 units per month. For every increase in price of \$3, the monthly demand will decrease by 15,000 units.

- .Fixed costs are \$100,000 per month and variable costs are \$2 per unit sold.

(i) Write down the cost ***C*** of widgets as a function of demand ***Q***.

C=100000+2**Q**

(ii) Write down the demand ***Q*** for widgets as a function of price ***P***.

Slope m = - 15000/3 = - 5000 ; b = 115000; Q=115000-5000**P**

(iii) If revenue, ***R*** is given by ***R=PQ***, write down revenue as a function of price.

$R = PQ = P[115000-5000P] = 115000P-5000P^2$

(iv) Using your answers to (i) and (ii), write down cost, ***C***, as a function of price, ***P***.

C = 100000+2[115000-5000P] = 330000 -10000P

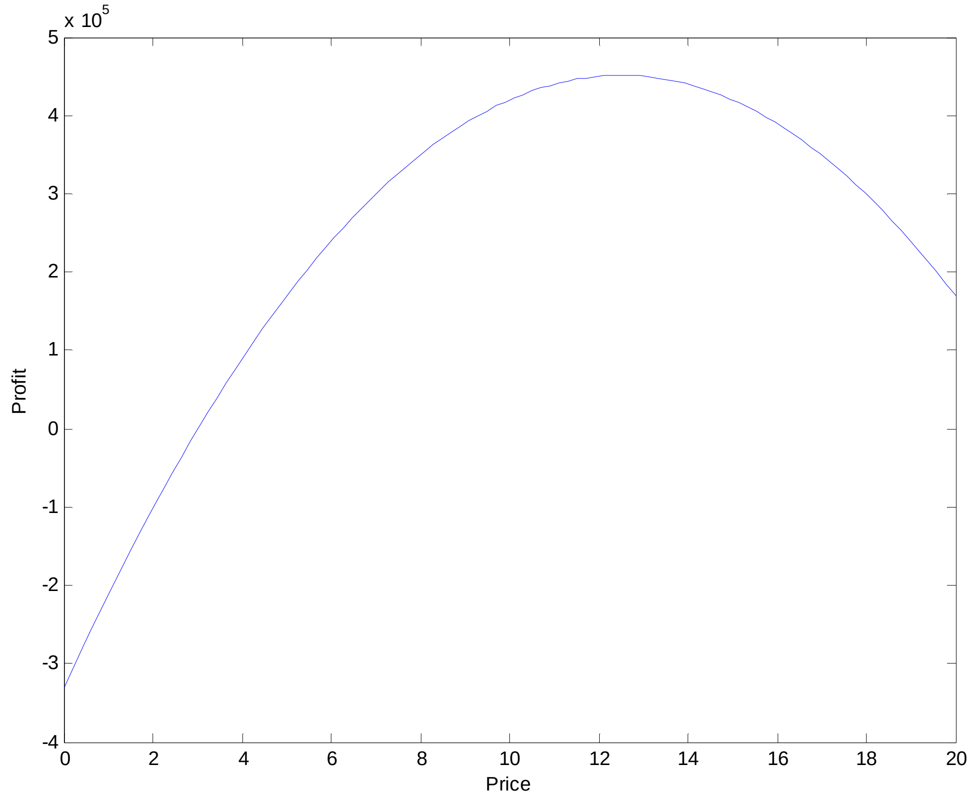
(v) If profit, ***Pr***, is given by ***Pr=R-C***, and write down an expression for profit as a function of price.

$Pr = 115000P-5000P^2 – [330000 -10000P] = 125000P–5000P^2 -330000$

(vi) Graph ***Pr*** vs ***P***. On your sketch you should indicate

a. The prices at which revenue=0

We know that R=PQ, so P=0 gives R=0 and Q=115000-5000P from (ii) so P=23 resulting in Q = 0 also gives R=0



b. The price which maximizes revenue

Maximum revenue is obtained when P = -b/2a = - 115000/2(-5000) = 11.5

c. The value of revenue at this price.

Sticking this back into our revenue equation gives us 661250

Profit Pr = $-5000P^2 + 125000P - 330000$

For maximum profit, P = - 125000/2(-5000) = 12.5

Maximum profit = $-5000(12.5)^2+125000(12.5) – 330000 = 451250$

The graph is shown above for Profit versus Price.