Contents

FEEDBACK ON PREVIOUS EXAMINATION PAPERS

MAY/JUNE 2014

Question 1

$1 + \frac{36}{45} \text{ x } \frac{5}{12} - \frac{1}{3}$

$\longrightarrow 1 + \left(\frac{36}{45} \; x \; \frac{5}{12}\right) - \frac{1}{3}$

$\longrightarrow 1 + \left(\frac{36}{45} \; x \; \frac{5}{12}\right) - \frac{1}{3}$

$\longrightarrow 1 + \frac{1}{3} - \frac{1}{3}$

$\longrightarrow$ **1** option 5

Question 2

$$\frac{(2a^2b^3)^2 \; x \; (ab^4)^3}{(2a^3b^2)^4}$$

$$\longrightarrow \frac{(2^2a^{2x2}b^{3x2})(a^3b^{4x3})}{2^4a^{3x4} \;\; b^{2x4}}$$

$$\longrightarrow \frac{4ab \; x \; a^3 \; b^{12}}{16a \; b}$$

$$\longrightarrow \frac{ab}{4ab}$$

$$\longrightarrow \frac{b^{10}}{4a^5} \qquad \textbf{(2)}$$

Question 3

Discount by 30% means its 70% (100 – 30)
: 70% = R490
100% = ?

$\Longrightarrow \frac{100}{70}$ X 490

$\Longrightarrow$ R700 **(1)**

Question 4

$\binom{x}{1}, \binom{y}{20}$ $\binom{x}{5}, \binom{y}{60}$

$\frac{y-y_1}{x-x_1}$ ← Gradient

$\frac{20-60}{1-5}$ - $\frac{-40}{-4}$ = 10

Y = mx + c
20 = 10(1) + c
20 – 10 = c
10 = c

: y = 10x + 10 **(4)**

Question 5
Cuts y – axis at 3 : c = 3
Parallel to y = 4x + 1 : m = 4

: equation ⟹ y = 4x + 3 **(3)**

Question 7
Selling price = R9
V.C. = 9X8% = R0.72
F.C = R50 000

Break – even point = $\frac{F.C}{contribution\ /\ unit}$

Contribution / unit = 9 – 0.72
= R8.28

: BEP = $\frac{50\ 000}{8.28}$

= 6038.65
= 6039units **(3)**

Question 8

7x + 3y = 45
10x + 5y = 70

7x + 3y = 45 ……(1)
2x + y = 14 ……..(2)

From (2) y = 14 – 2x

Substitute y in (1)
$7x + 3(14 – 2x) = 45$
$7x + 42 – 6x = 45$
$X = 45 – 42$
$X = 3$

$Y = 14 – 2x$
$Y = 14 – 2(3)$
$Y = 14 – 6$
$Y = 8$

Co-ordinates = (3;8) **(4)**

Question 9
$X + y + z = 8$ ……(1)
$X – 3y = 0$ ……..(2)
$5y – z = 10$ ……(3)

From (2), $x = 3y$
From (3), $z = 5y – 10$
Substitute both in (1)
$\Rightarrow x + y + z = 8$
$3y + y + (5y – 10) = 8$
$3y + y + 5y – 10 = 8$
$7y = 18$
$Y = 2$

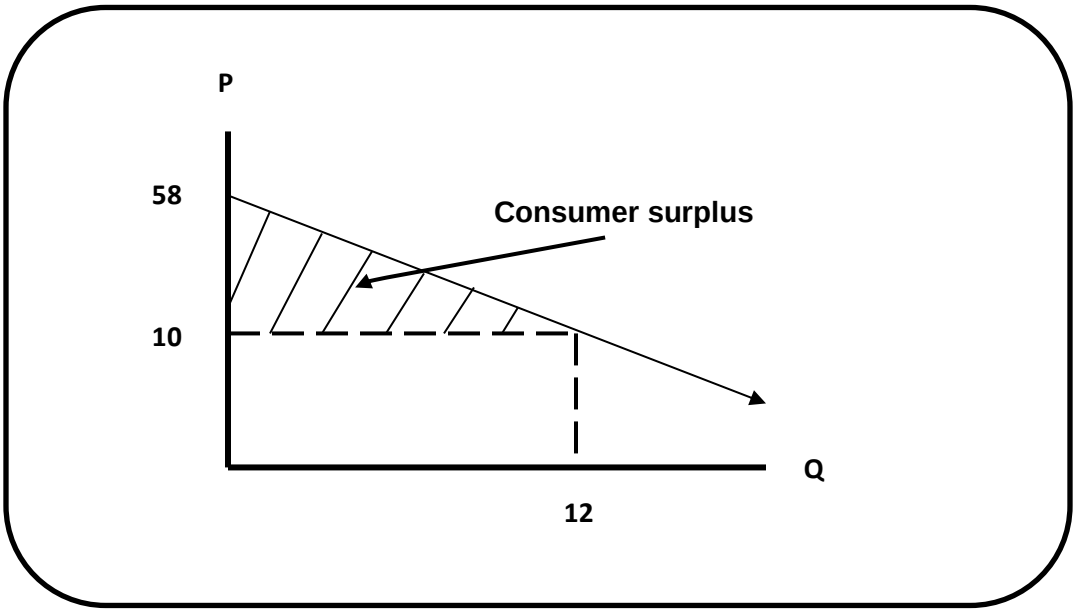
$X = 3(2)$
$X = 6$

$Z = 5(2) -10$
$= 10 -10$
$Z = 0$

Sum = 2+6+0
= 8 **(1)**

Question 10
$C + T = 22$
$300C + 240T \geq 6180 \leftarrow$ at least $C,T \geq 0$ **(3)**

Question 11
$P = 58 – 4Q$
$P = 10$



10 = 58 – 4Q
4Q = 58 – 10
4Q = 48
Q = 12

: ½ X 12 X 48
= 288 **(3)**

Question 12

B (t) = $\frac{8500}{1+15e^{-0.4t}}$

At t = 4hrs:

$\Longrightarrow \frac{8\,500}{1+15e^{-1.6}}$

$\Longrightarrow \frac{8500}{1+15\,(0.2019)}$

$\Longrightarrow \frac{8500}{4.02845}$

2109.99 (2)

Question 13

$log_2 \quad \left(\frac{2}{\sqrt{2}}\right) \implies \frac{log_{10}\left(\frac{2}{\sqrt{2}}\right)}{log_{10}\ 2}$

$\implies \frac{\log(\sqrt{2})}{\log 2}$

$\frac{\log\sqrt{2}}{\log 2} = \frac{0.150515}{0.301030}$

= 0.5000 **(2)**

Question 14
TC = $10u^2$ - 4U + 14 differentiate
MC = 20u – 4
= 20 (100) – 4
= 1996 (3)

Question 15
X + 2y ≤ 140 …… (1)
X + y ≤ 80 ……(2)
X, y ≥ 0

From (2) , x = 80 – y
In (1), (80 – y) + 2y = 140
80 – y + 2y = 140
80 + y = 140
Y = 140 – 80
Y = 60

In (2) x = 80 – 60
X = 20

: z = 20_x + 30y

= 20 (20) + 30 (60)
= 400 + 1800
= 2200 (2)

Question 16
(200x4) + 64
800 + 64
864 (2)

Question 17

7 : 3 : 3: 1
Price of the car:
7 + 3 + 3 + 1 = 14

$\frac{3}{14}$ x 250 000

535 71.43 **(1)**

Question 18

$5x^2$ - 6x + 1 = 0

$5x^2$ & -6x

: -5x & -x

$5x^2$ - 5x – x + 1 = 0

5x (x-1) – 1(x -1) = 0
(5x – 1) (x – 1) = 0
5x – 1 = 0 or x – 1 = 0
Sx = 1 or x = 1
X = 1/5 or 1 (1)

Question 19

Y = $-x^3$ + $9x^2$ - 24x + 26

Maximum value or minimum:

$\Longrightarrow$ Differentiate $-x^3$ + $9x^2$ - 24x + 26

$-3x^2$ + 18x -24

$-3x^2$ + 18x – 24 = 0

$-x^2$ + 6x – 8 = 0

$-x^2$ + 2x + 4x – 8 = 0

-x (x – 2) +4 (x – 2) = 0

(-x +4) = 0 (x -2) = 0

X = **4 or 2** **(2)**

Question 20

Y = $-x^2$ + 8x – 16
$-x^2$ + 4x + 4x – 16
-x (x – 4) + (x -4)
(- x + 4) (x – 4)
X = 4 (4)

Question 21
Derivative of

F(x) = $3x^6 + x^4 + \sqrt{x}$ + 300

= $3x^6 + x^4 + x^{\frac{1}{2}}$ + 300

: f^1 (x) = $18x^5 + 4x^3 + \frac{1}{2}x^{-\frac{1}{2}}$ (4)

Question 22
X + 8y $\leq$ 400
X + 2y $\geq$ 200
X,y $\geq$ 0

X + 8y = 400 …… (1)
X + 2y = 200 ……(2)

When y = 0
X = 400

When x = 0 , y = 50

When y = 0 , x = 200
When x = 0, y = 100 **(1)**

Question 23

Demand function Q = 6000

Cost function c = (Q) = 72 000

R = p x q
= p (6000 – 30p)
= 6000p – $30p^2$ **(2)**

Question 24

$\int \left(\sqrt{x^3} + 2x + x^{\frac{1}{2}}\right) dx$

$\int \left((x^3)^{\frac{1}{2}} + 2x + x^{\frac{1}{2}}\right)$ dx

$\int \left(x^{\frac{3}{2}} + 2x + x^{\frac{1}{2}}\right)$ dx

$\frac{2x^{\frac{5}{2}}}{5} + x^2 + \frac{2x^{\frac{3}{2}}}{3}$ + c (4)

Question 25
$\left(\int_1^2 4x^3 - 3x^2\right)$ dx

x^4 - x^3

$((2)^4 - (2)^3)$ - $((1)^4 - (1)^3)$
(16 – 8) – (1 – 1)
8 – 0
= 8 (2)

Question 26
Q = 150 – 0.5p

Revenue = p x Q
= P (150 – 0.5P)
= 150P – $0.5P^2$

Marginal revenue = differential of revenue function $\Longrightarrow$ 150 – P

: 150 – P = 0
P = 150 (2)

Question 27
Marginal cost = differential of cost function:
MC = Q^2 - 60q + 2800
= $(8)^2$ - 60 (8) + 2800
= 3344 (5)

Question 28
R(x) = 1/5 x^2 + 30x + 100
Maximum revenue, fins 1st derivative of the revenue functions thus:

R^1 (x) = $-\frac{2}{5}x + 30$

0 = $-\frac{2}{5}x + 30$

$^2/_5\ x = 30$

X = 75

- $\frac{1}{5}(75)^2 + 30(75) + 100$
  $-1125 + 2250 + 100$
  1225 (2)

Question 29
Number of lessons = x
Fixed costs = R1000
Variable costs = R90 X x

: total cost = 90x + 1000 (4)

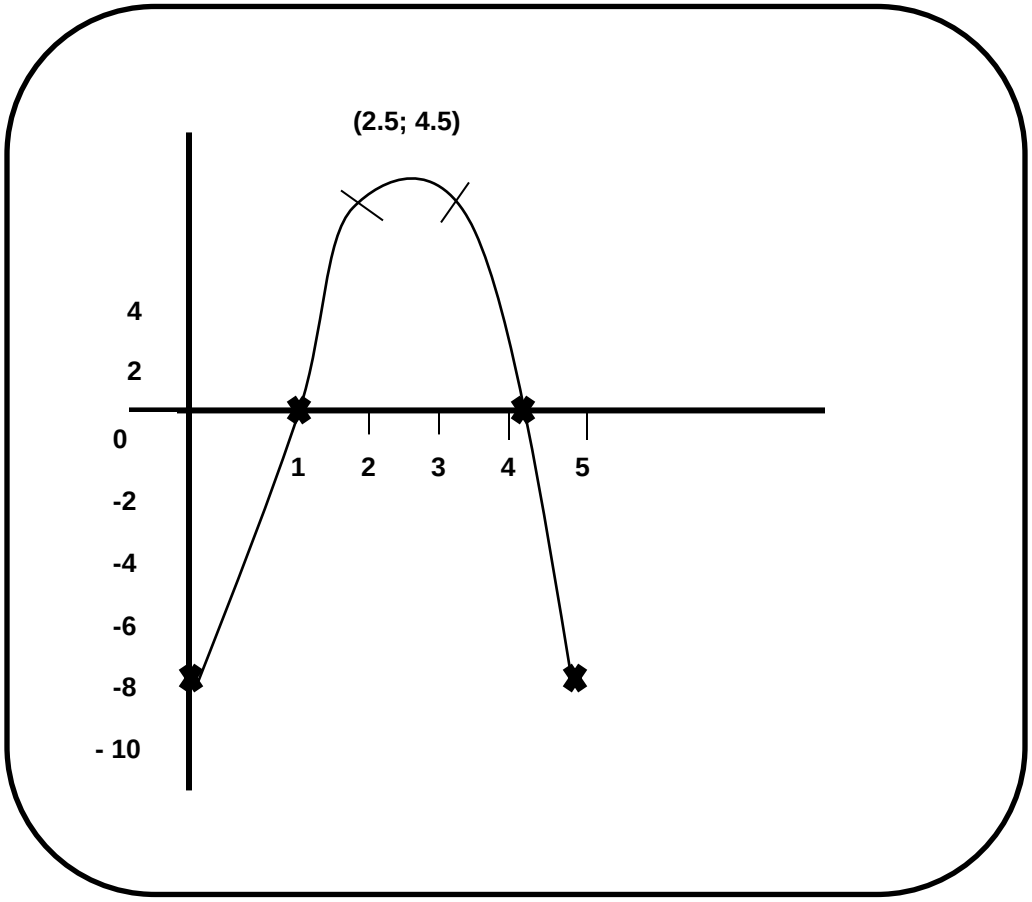
Question 30
$8x^2$ + 2y = $4x^2$ + 20x - 16

2y = $4x^2$ - $8x^2$ + 20x - 16

Y = $2x^2$ - $4x^2$ + 10x - 8
Y = $2x^2$ + 10x – 8

Y = $-2x^2$ + 10x – 8

X	0	1	2	3	4	5
y	-8	0	4	4	0	-8



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OCTOBER / NOVEMBER 2013

Question 1

$1 + \frac{36}{45} \times \frac{5}{12} - \frac{3}{2}$

$1 + \left(\frac{36}{45} x \frac{5}{12}\right) - \frac{3}{2}$

$1 + \left(\frac{3}{93}\right) - \frac{3}{2}$

$1 + {}^{1}/_{3} - {}^{3}/_{2}$

${}^{4}/_{3} - {}^{3}/_{2}$

$-{}^{1}/_{6}$ (5)

Question 2

$6p^2$ x 9pq x $4p^2$ q^2

$\Longrightarrow 216p^{2+1+2} q^{1+2}$

$\Longrightarrow 216p^5 q^3$ (4)

Question 3

Price + mark – up $\Longrightarrow$ 100%

: 120% = r36
: 100% = ?

$\frac{100}{120}$ x 36

= R30 (3)

Question 4

Line passes through (5;1)
Parallel to y = -2x
Y = mx + c
Gradient (m) = -2

Y = -2x +c
I = -2)(5) +c

I = 10 + c
11 = c

: equation = y = -2x + 11 (1)

Question 5

-6(x + 1) = -3x -2y
2y = -3x + 6(x +1)
2y = -3x + 6x +6
2y = 3x + 6
Y = $\frac{3}{2}$x + 3

Slope $\Longrightarrow$ coeffient of x $\Longrightarrow$ $\frac{3}{2}$ (2)

Question 6
P = 70 -0.5q
0.5q = 70 – p
Q = 140 - $\frac{p}{0.5}$

Q = 140 – 2p

$\frac{DQ}{DP}$ = -2

PED = $\frac{\Delta Q}{\Delta P}$ X $\left(\frac{P}{Q}\right)$

= -2 X $\frac{P}{140-2P}$

$\frac{-2P}{140-2P} \div \frac{-2}{-2}$

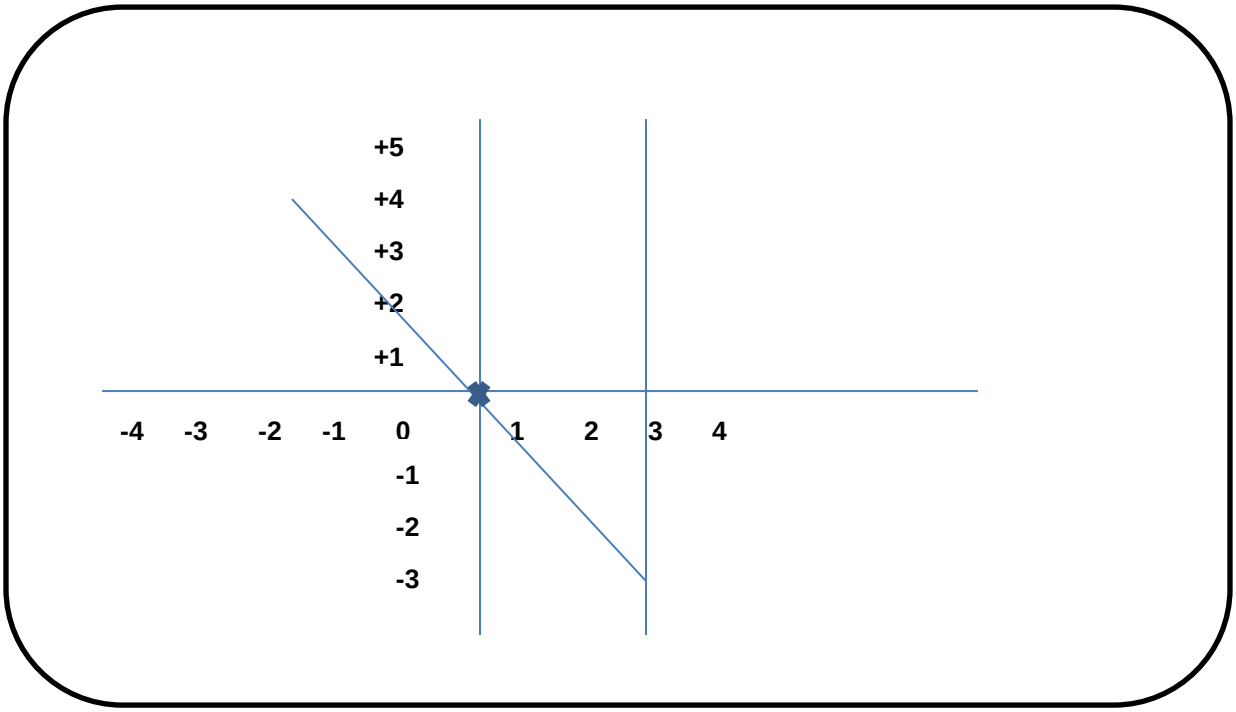
= $\frac{P}{-70+P}$

= $\frac{P}{P-70}$ (2)

Question 7
Y – x $\leq$ 2
Y + x $\geq$ 0
X $\leq$ 3

Y = x + 2 …… (1)
Y = -x …… (2)
X = 3 …… (3)

	X	-3	-2	-1	0	1	2	3
1	Y	-1	1	2	3	4	5	6
2	y	3	2	1	0	-1	-2	-3



Question 8
Od = 400 – 5Qd
Ps = 3q + 24

400 – 5q = 3q + 24
400 – 24 = 3q + 5q
8q = 376
Q = 47

P = 3(47) + 24
P = 165 (1)

Question 9

X + 2y – z = 5 ……. (1)
2x – y + z = 2 ……. (2)
Y + z = 2 …… (3)

From (3), y = 2 – z

X + 2(2 –z) – z = 5

2x – (2 – z) + z = 2

X + 4 – 2z – z = 5

2x -2 + z + z = 2

X – 3z = 1 2

2x + 2z = 4 1

2x – 6z = 2

$\frac{2x}{0} + \frac{2z}{-8z} = \frac{4}{-2}$ -

Z = $\frac{1}{4}$

Y = 2 - $\frac{1}{4}$

= $\frac{7}{4}$

X = 5 – 2y + z

= 5 – 2 $\left(\frac{7}{4}\right)$ + $\left(\frac{1}{4}\right)$

= 5 - $\frac{7}{2}$ + $\frac{1}{4}$

= $\frac{7}{4}$

$\frac{1}{4} + \frac{7}{4} + \frac{7}{4} = \frac{15}{4}$ (1)

Question10

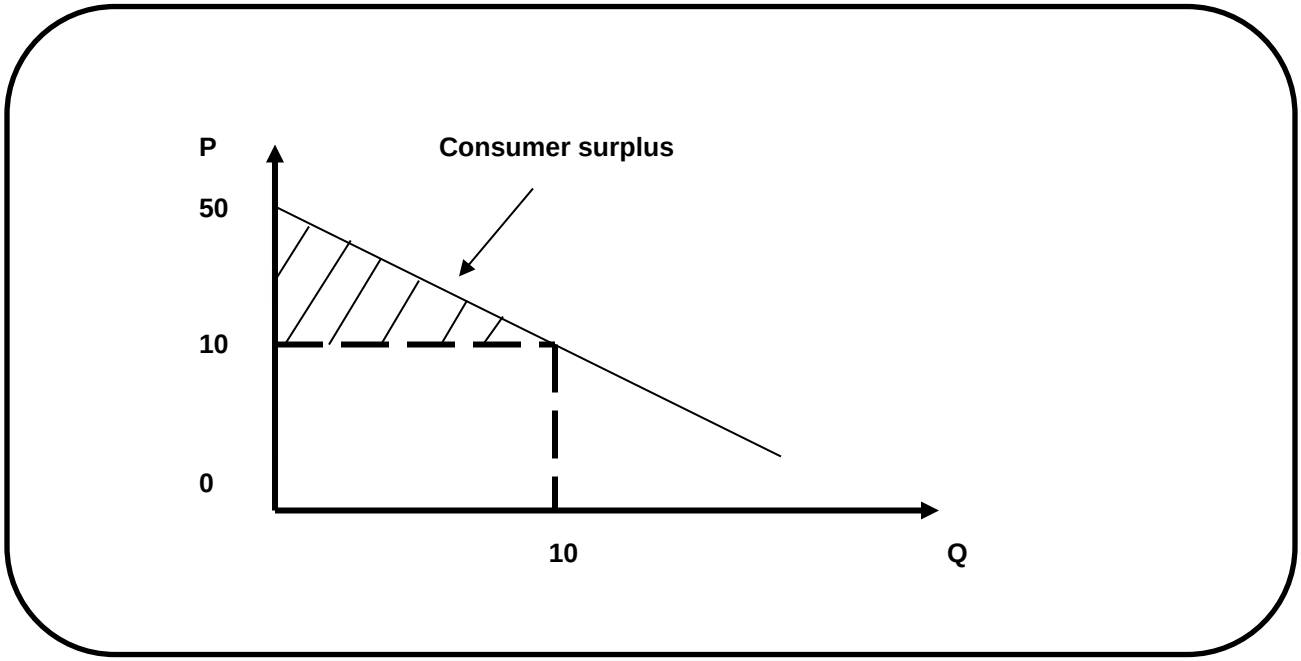
	A	B	
Processing	30m	12m	≤ 240m

Assembly	18m	72m	≤ 360m
Packaging	24m	48m	≤ 288m

: $30x + 12y \leq 240$
$18x + 72y \leq 360$
$24x + 48y \leq 288$

$5x + 2y \leq 40$
$X + 4y \leq 20$
$X + 2y \leq 12$
$X,y \geq 0$ (1)

Question 11
Consumer suplus $\Longrightarrow$ area below demand curve, above price line.
$P = 50 – 4q$



When $p = 10$
$10 = 50 – 4Q$
$4q = 50 – 10$
$Q = 10$

$\frac{1}{2}$ X 10 X 40
= 200

Question 12

2In $\left(\sqrt{e^{2x^2}}\right)$

$\Longrightarrow$ 2 In $\left(e^{2x^2}\right)^{\frac{1}{2}}$

$\Longrightarrow$ 2In $\left(e^{2x^2\frac{1}{2}}\right)$

$\Longrightarrow$ 2 In $\left(e^{e^2}\right)$

$\Longrightarrow$ 2 In e^{x^2} * In e^{x^2} = x^2

$\Longrightarrow$ 2.x^2

$\Longrightarrow$ $2x^2$ (2)

Question 13

log_2 1 + log_2 8

$\Longrightarrow$ $\frac{In\ 1}{In\ 2}$ + $\frac{In\ 8}{In\ 2}$ or $\frac{Log\ 1}{Log\ 2}$ + $\frac{Log\ 8}{Log\ 2}$

$\Longrightarrow$ 3.000 (2)

Question 14

P (t) = $2500e^{0.0293t}$

When t = 0 it will be in 2000
Population = $2500e^{0.0293(0)}$
= 2500

In 2010 , it will be after 10years
: t = 10

$\Longrightarrow$ $2500e^{0.0293\ (10)}$
$\Longrightarrow$ $2500e^{0.293}$

$\Longrightarrow$ 3351.10
$\Longrightarrow$ 3351 (2)

Question 15
12^{3x+5} = 250
(3x +5) In12 = In 250

3x + 5 = $\frac{In\ 250}{In12}$
3x + 5 = 2.221999
3x = 2.221999 – 5
3x = -2.7780007
X = -0.926 (3)

Question 16
P(x) = $x^3 + 3x^2$ + 72x + 1280
Maximize profit

p^1 (x) = $-3x^2$ + 6x + 72
0 = $-x^2$ + 2x + 24
0 = $-x^2$ - 4x + 6x + 24
0 = -x(x+4) +6(x +4)
0 = (-x +6) (x +4)
X = 6 or -4

Units cannot be negative, therefore it's not (-4)
Answer = 6 (1)

Question 17
Y = $-x^2$ + 6x – 5
To break even, y= 0

: $-x^2$ + 6x -5 = 0
$-x^2$ + x + 5x – 5 = 0

-x (x-1) +5(x-1) = 0
(-x+5) (x -1) = 0
X = 5 or 1 (2)

Question 18
x^2 - 2x – 6 = -3x
x^2 - 2x + 3x – 6 = 0
x^2 + x – 6 = 0
x^2 - 2x + 3x – 6 = 0
X(x -2) +3 (x-2) = 0
(x +3) (x -2) = 0
X = -3 or 2 (1)

Question 19
Y = x^3 - 12x +6
Maximum values

y^1 = $3x^2$ - 12

$3x^2$ - 12 = 0
$3x^2$ = 12
x^2 = 4
$\sqrt{x^2}$ = $\sqrt{4}$
X = $\pm$ 2 (3)

Question 20
Y = $-2x^2$ + 10x – 8
0 = $-x^2$ + 5x – 4
0 = $-x^2$ + x + 4x – 4
0 = -x(x -1) +4(x -1)
(-x +4) or (x – 1) = 0
X = 4 or 1

4 or 1 will give 0
5 will give -8
: 3 (2)

Or $y^1 \Longrightarrow$ -4x + 10
-4 xs + 10 = 0
4x = 10
X = 10/4
X = 2.5
: Approximately 3 (2)

Question 21
F(x) = $\frac{3}{x^3} + \frac{4}{\sqrt{x}}$ + 1

= $3x^{-3} + 4x^{-\frac{1}{2}}$ + 1
f^1 (x) = $-9x^{-4}$ - $2x^{-\frac{3}{2}}$

= $\frac{-9}{x^4} - \frac{2}{x^{\frac{3}{2}}}$ (2)

Question 22
20x + 30y $\geq$ 600
10x + 20y $\geq$ 360
4x + y $\geq$ 40
X,y $\geq$ 0

Minimum value of cost function
C = 5x + 4y
When the line 20x + 30y $\geq$ 600
Meets the line 4x + y $\geq$ 40
2x + 3y = 60

4x +y = 40
Y = 40 – 4x
2x + 3(40 -4x) = 60
2x + 120 -12x = 60
-10x = -60
X = 6

Y = 40 -4(6)
Y = 16

C = 5(6) + 4(16)
=94 (4)

X – intercept of y = 5x -10

5x = y +10
X = 1/5y +2
X = intercept = 2 (4)

Question 24

$\int \left(x^3 + 2x + x^{\frac{1}{2}}\right)$ dx

$\frac{x^4}{4} + x^2 + \frac{2x^{\frac{3}{2}}}{3}$ + c (3)

Question 25

$\int_1^2 (4x^3 - 3x^2)dx$

x^4 - x^3

$((2)^4 - (2)^3)$ - $((1)^4 - (1)^3)$
= 8 -0
= 8 (2)

Question 26
Q = 150 – P
R = P X Q
: P(150 –P)
R = 150P - P^2
M_R = 150 - 2P

150 - 2P = 0
150 = 2P

P = 75 (1)

Question 27
TC = $\frac{1}{3}Q^3$ - $30Q^2$ + 2800Q + 900

MC = Q^2 - 60Q + 2800
When Q = 8
$\Longrightarrow$ $(8)^2$ - 60(8) + 2800

$\Longrightarrow$ 2384 (1)

QUESTION 28
R(x) = $-\frac{1}{5}x^2$ + 30x + 81

Maximum revenue, 1st find the 1st derivative of the r(x) function thus:

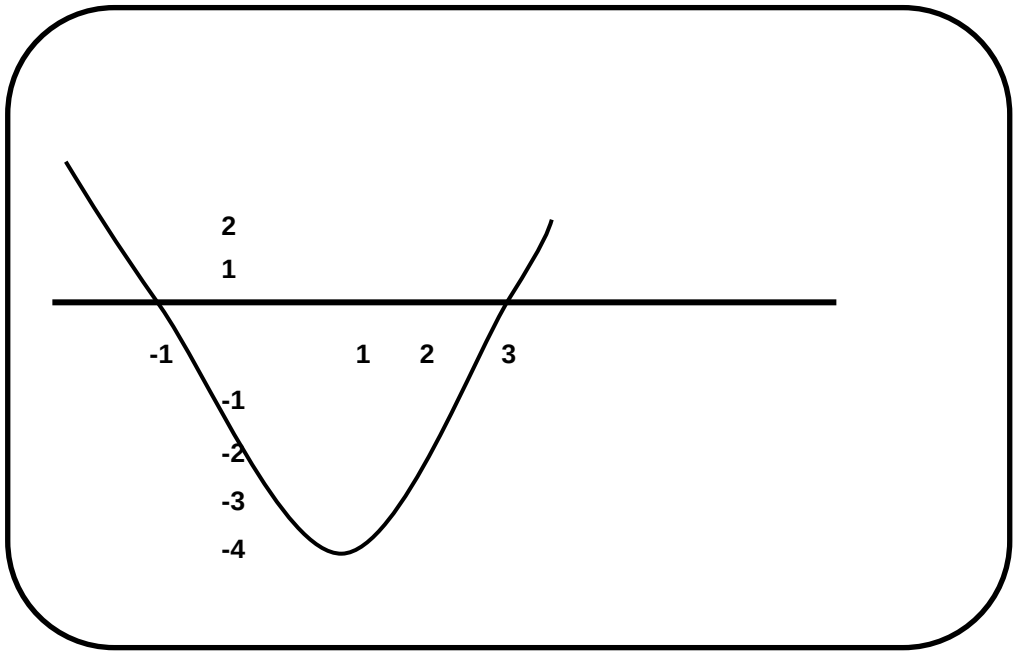
- $\frac{2}{5}$x + 30 = 0
- $2x + 150 = 0$
- -2x = -150
  X = 75

- $\frac{1}{5}$ $(75)^2$ + 30(75) + 81

  1206 (2)

Question 29
Y = -2x + x^2 - 3

X	-3	-2	-1	0	1	2	3
y	12	5	0	-3	-4	-3	0



(3)

Question 30

Number of lessons = x
Fixed costs = 1250
Variable costs = 30
Total cost = 30x + 1250 (4)

MAY/JUNE 2013

Question 1

$1 + \frac{36}{45} \times \frac{5}{12} - \frac{2}{3}$

$1 + \left(\frac{36}{45} \; x \; \frac{5}{12}\right) - \frac{2}{3}$

$1 + \frac{1}{3} - \frac{2}{3}$

$\frac{2}{3}$ (5)

Question 2

$\ln\left(\sqrt{e^{2x^2}}\right)$

$\Longrightarrow \ln \left(e^{2x^2}\right)^{\frac{1}{2}}$

$\Longrightarrow \ln\left(e^{2x^2 \cdot \frac{1}{2}}\right)$

$\Longrightarrow \ln e^{x^2}$ * Ine^n = n *

$\Longrightarrow x^2$ (1)

Question 3

If price is 35% lower, then it is 65% (100 – 35)
: 65% = R3315
100% = ?

$\frac{100}{65}$ X 3315

R5100 (2)

Question 4

$\sqrt{\frac{4x^2}{y^{-4}}}$ x > 0

$\Longrightarrow \sqrt{4x^2.y^4}$

$\Longrightarrow (4x^2.y^4)^{\frac{1}{2}}$

$\Longrightarrow 4^{\frac{1}{2}}. x^{2\,x\,\frac{1}{2}} . y^{4\,x\,\frac{1}{2}}$

$\Longrightarrow$ 2. X. y^2

= $2xy^2$ (3)

Question 5

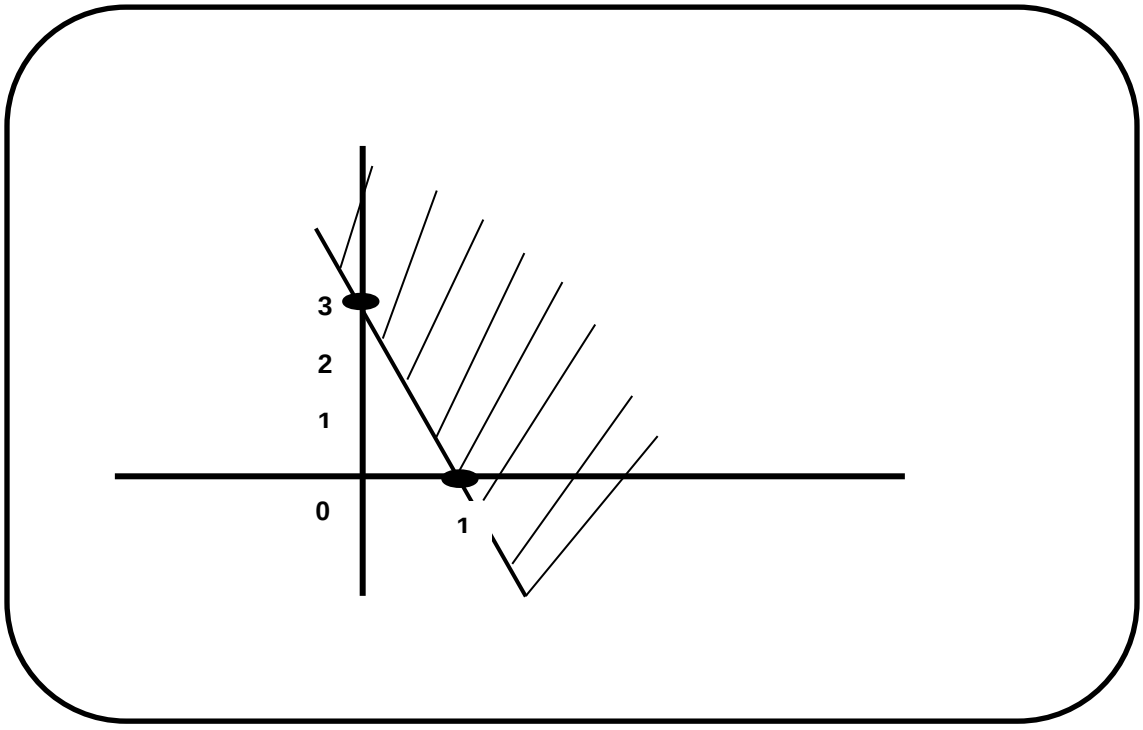
$log_{20}\ \left(\frac{410}{1234}\right)$

$\Longrightarrow \frac{\log\left(\frac{410}{1234}\right)}{\log 20}$

$\Longrightarrow$ -0.3678 (4)

Question 6

Y ≥ 3 – 3x
Draw a graph of y = 3-3x
When x = 0, y = 3
When y = 0, x = 1



(1)

Question 7
Slope is the coefficient of x in a function of y

V = 6 + 3x -2y
2y 3x + 6
Y = $\frac{3}{2}$ x + 3

$\frac{3}{2}$ is the slope (2)

Question 8
When C = 40, Q = 10
C = 70 , Q = 20

(10,40) (20,70)

Gradient $\Longrightarrow$ $\frac{70-40}{20-10}$

Using , y = mx + c
40 – 30 = c
C = 10

: y = 3x + 10
Thus C = 3Q + 10
When Q = 35
C = 3(35) + 10
C = 105 + 10
C = 115

Question 9
2y + 4x +8 = 8x +1 & zx – 4 : parallel

2y + 4x – 8x + 8 – 1 = 0
2y – 4x + 7 = 0
2y = 4x – 7
Y = 2x - $\frac{7}{2}$

Value of z = 2 (1)

Question 10

$\frac{1288.40-988.20}{1288.40}$ x 100

23.30%

Or 1288.40 = 100
988.2 = ?

100 - $\left(\frac{988.2}{1288.4}\ x\ 100\right)$

100 – 76.70
= 23.30%

Question 11
P = 40 – Q
Q = 40 – P

$\frac{\Delta Q}{\Delta P}$ = -1

P∈ D = $\frac{\Delta\, Q}{\Delta\, P}$ X $\frac{P}{Q}$

-1X $\frac{P}{40-P}$ = $\frac{-P}{40-P}$

= $\frac{P}{P-40}$ (4)

Question 12
P = 60 – 0.2Q
0.2Q = 60 – P
Q = 300 – 5P

$\frac{\Delta Q}{\Delta P}$ = -5

When P = 50
Q = 300 – 5 (50)
= 50

When = p = 40
Q = 300 – 5(4)
= 100

Elasticity = $\frac{\frac{P_1+P_2}{2}}{\frac{Q_1+Q_2}{2}}$ X $\frac{\Delta Q}{\Delta P}$

$= \frac{\frac{50+40}{2}}{\frac{100+50}{2}}$ X -5

$= \frac{45}{75}$ X -5

$= \frac{3}{5}$ X -5

= -3 (3)

Question 13

X + y + z = 8 ……. (1)
X – 3y = 0 …….. (2)
5y – z = 10 ……. (3)

From (2) x = 3y

Substitute in (i)

3y + y + z = 8

\+ 4y + z = 8
5y – z = 10

9y = 18

$\frac{9y}{9} = \frac{18}{9}$

Y = 2

X = 3y
X = 3(2)
X = 6

5y – 10 = z
5(2) – 10 = z
Z = 10 – 10
Z = 0

Sum $\Longrightarrow$ 2 + 6 + 0
= 8 (1)

Question 14
Equilibrium price and quantity of :

Q = 50 – 0.1P

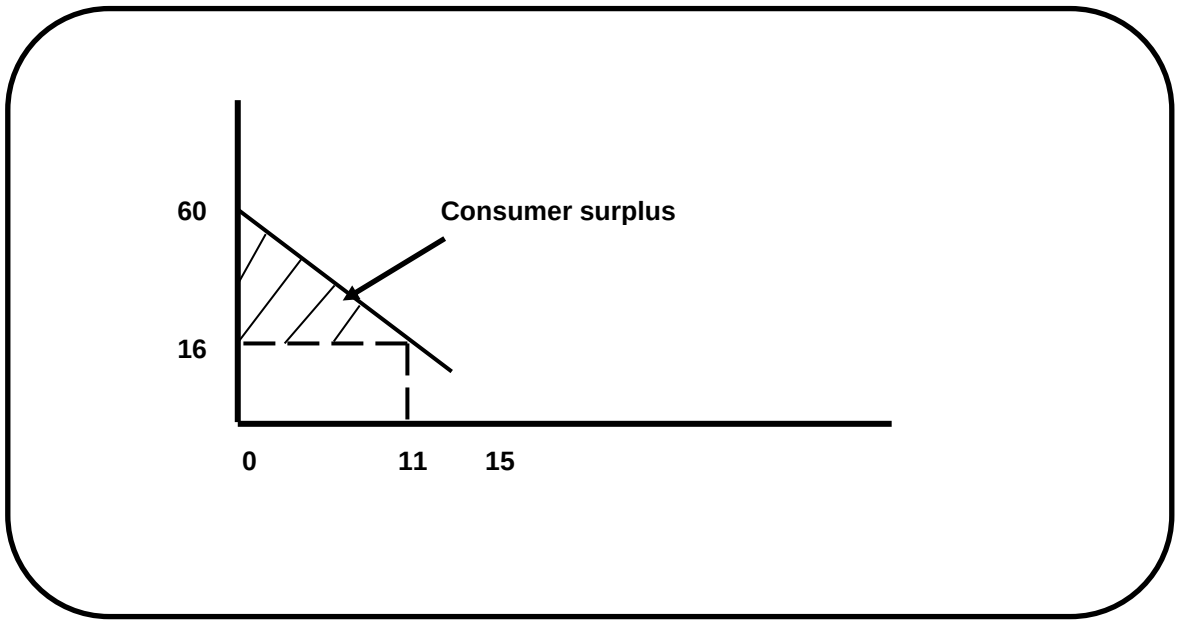
Q = -10 + 0.1P

60 = 0.2p
P = 300

Q = 50 – 0.1 (300)
= 50 – 30
Q = 20 (1)

Question 15
Y = 240x + 720
If cost = R30 000
30 000 = 240X + 720
30 000 – 720 = 240X
29280 = 240X
29 280 = 240X
X = 122 (2)

Question 16
Consumer surplus is area above price line, below demand curve
P = 60 – 4Q
When Q = 1, P = 60
P = 0, Q = 15



When P = 16, Q = 11

Question 17

Q(t) = 50 – $30e^{-0.05t}$

40 = 50 - $30e^{-0.05t}$
$30e^{-0.05t}$ = 50 – 40
$30e^{-0.05t}$ = 1
$e^{-0.05t}$ = 1/3

$Ine^{-0.05t}$ = In $\frac{1}{3}$
-0.05t = In $\frac{1}{3}$
T = $\frac{In\frac{1}{3}}{-0.05}$

= 2.197
T = 22 (4)

Question 18

Cake 1 (x) cake 2 (y)
Flour 1.8kg 0.75kg ≤ 18kg
Eggs 3 2 ≤ 36
Sugar 0.4kg 0.6kg ≤ 10

: 1.8x + 0.75y ≤ 18
3x + 2y ≤ 36
0.4x + 0.6y ≤ 10

X,y ≤ 0 (1)

Question 19
Roots of:
Y = $x^2 + x - 6$
x^2 + 3x – 2x – 6
X (x + 3) -2 (x +3) = 0
(x -2) (x+3) = 0
X -2 = 0 or x + 3 = 0
X = 2 or -3 (1)

Question 20
Q = 150 – 0.5P

Revenue = P X Q

= P(150 – 0.5P)
= 150P – $0.5P^2$

Marginal Revenue = derivative of the revenue function
Mr = 150 – p
0 = 150 – p
P = 150 (1)

Question 21
Number of lessons = x
Fixed costs = R1250
Variable costs = R50/lesson

: Total cost = 50x + 1250 (1)

Question 22
Coordinates of points of intersection
2x + y -5 = 0
3x – 2y -4 = 0

X 3 | 2x + y = 5
2 | 3x – 2y = 4

6x +3y = 15

$\frac{6x}{0} - \frac{4y}{7y} = \frac{8}{7}$

Y = 1

2x +1 – 5 = 0
2x – 4 = 0
2x = 4
X = 2 (3)

Question 23
Y = $-x^2$ + 6x +7
Max profit is when y^1 = 0
: y^1 = -2x + 6
0 = -2x + 6

2x = 6

X = 3

Substitute x in profit function

-(3^2) + 6(3) + 7

-9 + 18 + 7

= 16 (2)

Question 24

F(x) = x^3 + $3x^2$

f^1 (x) = $3x^2$ + 6x

$3x^2$ + 6x = 0

x^2 + 2x = 0

$x\,(x+2) = 0$

X = 0 or x = -2

: x = 0 , x = -2

Question 25

TC = $2Q^3$ - Q^2 + 80Q + 150

MC = $6Q^2$ - 2Q + 80

When Q = 10

$\Longrightarrow$ $6(10)^2$ - 2 (10) + 80

$\Longrightarrow$ 600 – 20 + 80

$\Longrightarrow$ 660 (3)

Question 26

F(x) = x^2 + 5x + $\sqrt{x^3}$

x^2 + 5x + $(x^3)^{\frac{1}{2}}$

f^1 (x) = 2x + 5 + $\frac{3}{2}x^{\frac{1}{2}}$

$= 2x + 5 + \frac{3}{2}\sqrt{x}$

Question 27

$\int \left(x^2 + 2x + x^{\frac{1}{2}}\right)$ dx

$\Longrightarrow \frac{x^3}{3} + x^2 + \frac{2}{3x}^{\frac{3}{2}}$ + c (3)

Question 28

$\int_{-1}^{2}(-4x + 6)$ dx

$-2x^2$ + 6x

$[(-2)(2)^2 + 6(2)] - [(-2)(-1)^2 + 6(-1)]$

$(-8+12)$ – (-2 -6)

$4 - -8$

$= 12$ (3)

Question 29

2x + 6y = 30

4x + 2y = 20

X + 3y = 15

X = 15 – 3y

4(15- 3y) + 2y = 20

60 – 12y + 2y = 20

60 – 10y = 20

40 = 10y

Y = 4

X = 15 – 3(4)

X = 3

Z = 18(3) + 12 (4)

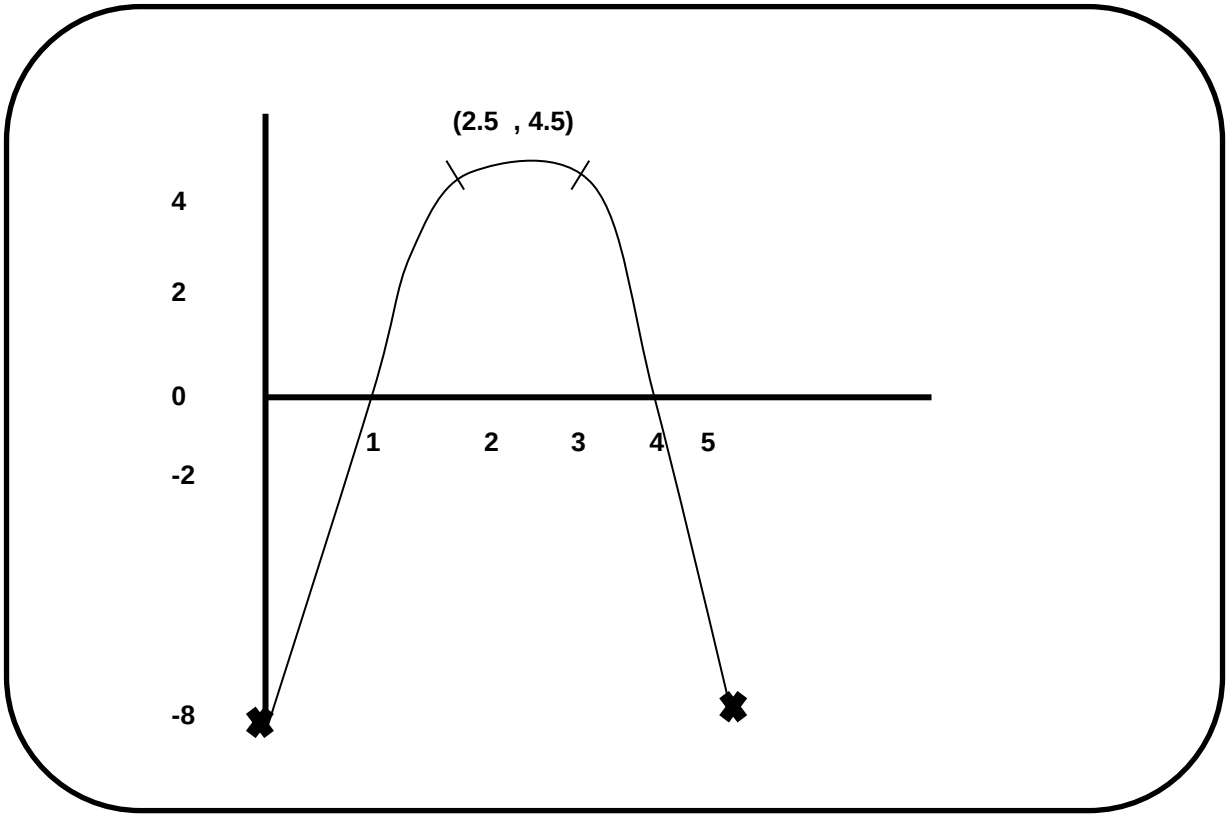
= 102

Question 30

2y = $-4x^2$ + 20x – 16

Y = $-2x^2$ + 10x – 8

X	0	1	2	3	4
y	-8	0	4	4	0



(2)

OCTOBER / NOVEMBER 2012

Question 1

$\frac{1}{6} - \frac{5}{6} - \frac{2}{3} + \frac{1}{3} \times \frac{3}{4}$

$\frac{1}{6} - \frac{5}{6} - \frac{2}{3} + \left(\frac{1}{3} \times \frac{3}{4}\right)$

$\frac{1}{6} - \frac{5}{6} - \frac{2}{3} + \frac{1}{4}$

$- \frac{13}{12}$

Question 2

VAT = 21%

Price In. VAT = 121%

121% = 485

100 = ?

$\frac{100}{121}$ X 485

R400.83 (4)

Question 3

$5^{3x+8} = 5^5$

3x + 8 = 5

$\frac{3x}{3} = \frac{-3}{3}$

X = -1 (2)

Question 4

Roots of equation

$0 = x^2 + x - 6$

x^2 - 2x + 3x – 6

X (x – 2) +3 (x – 2)

(x +3) (x -2) = 0

X = -3 or 2 (1)

Question 5

$log_5 \left(\frac{15}{0.45}\right)$

$\Longrightarrow \frac{\log\left(\frac{15}{0.45}\right)}{\log 5}$

$\Longrightarrow$ 2.179 (2)

Question 6

In 2003 $\Longrightarrow$ R366 000

2007 $\Longrightarrow$ R480 000

Percentage increase

$\frac{480\,000-366\,000}{366\,000}$

31.15% (3)

Question 7

G(Q) = $\frac{\sqrt[4]{Q}}{Q^2}$

G(Q) = $4(Q)^{\frac{1}{2}} . Q^{-2}$

= $4Q^{-\frac{3}{2}}$

G^1 (Q) = $-6Q^{-\frac{5}{2}}$

Question 8

If lines are parallel , the coefficient of x/gradient is the same:

3y – 6x + 8 = -1

3y = -1 + 6x – 8

3y = 6x -9

Y = 2x – 3

T = 2

Question 9

$\int_{x=1}^{x=5}(2x + x^3)\,dx$

$\Longrightarrow \quad x^2 + \frac{x^4}{4}$

$\Longrightarrow \left(5^2 + \frac{5^4}{4}\right) - \left(1^2 + \frac{1^4}{4}\right)$

$\Longrightarrow \left(25 + \frac{625}{4}\right) - \left(1 + \frac{1}{4}\right)$

$\Longrightarrow$ 181.25 – 1.25

$\Longrightarrow$ 180 (1)

Question 10

F(x) $= -2x^2$ + 10x – 8

f^1(x) = -4x + 10 (2)

Question 11

$\int(3x^2 - 2x)dx$

x^3 - x^2 + c (4)

Question 12

P = 80 – 2Q

2Q = 80 – P

Q = 40 - $\frac{1}{2}$P

$\frac{\Delta Q}{\Delta P}$ = - $\frac{1}{2}$

P∈ D = $\frac{\Delta Q}{\Delta P}$ X $\frac{P}{Q}$

= ½ X $\frac{P}{40-\frac{P}{40-\frac{1}{2}P}}$

= $\frac{-0.5P}{40-0.5P}$

= $\frac{P}{-80+P}$

= $\frac{P}{P-80}$ (3)

Question 13

Log Q – log $\left(\frac{Q}{Q+1}\right)$ = 0.8

LOG $\left(Q \div \left(\frac{Q}{Q+1}\right)\right)$ = 0.8

Log $\left(q + \frac{q+1}{q}\right)$ = 0.8

$log_{10}(Q+1)$ = 0.8

$10^{0.8}$ = Q + 1

$10^{0.8}$ - 1 = Q

6.3096 – 1 = Q

5.3096 = Q

Q = 5.31 (1)

Question 14

$-x - 3 \geq 6 - 2x$

$-x + 2x \geq 6 + 3$

$X \geq 9$ (3)

Question 15

$R(X) = -\frac{1}{5}X^2 + 30X + 81$

REV is at its max when its R^1 (X) = 0

$R^1(X) = -\frac{2}{5}X + 30$

$0 = -\frac{2}{5}X + 30$

$+\frac{2}{5}X = 30$

$X = 30 \div \frac{2}{5}$

$X = 30 \times \frac{5}{2}$

X = 75

Put the value of x back in the Revenue function

- $\frac{1}{5}(75)^2 + 30(75) + 81$
- $-1125 + 2250 + 81$
- $1125 + 81$
- = 1206

Question 16

Y – intercept of 5y – 10x + 5 = -2x + 3y

5y – 3y = 10x – 2x – 5

2y = 8x – 5

Y = 4x – 5/2

Y – intercept = - 5/2 or 2 $\frac{1}{2}$ (2)

Question 17

F(x) = x^3 + $5x^2$

At its min or max, f^1 (x) = 0

f^1 (x) = $3x^2$ + 10x

$3x^2$ + 10x = 0

X (3x +10) = 0

X = 0 or 3x + 10 = 0

3x = -10

X = -$\frac{10}{3}$ (1)

Question 18

Points $\begin{pmatrix} x & y \\ 2 & 1 \end{pmatrix}$ and $\begin{pmatrix} x & y \\ 1 & 2 \end{pmatrix}$

Y = mx + c ⟵ equation

Gradient = $\frac{y_1 - y}{x_1 - x}$

= $\frac{2-1}{1-2}$ = $\frac{1}{-1}$

M = -1

Y = mx + c

I = -1(2) +c

I = -2 + c

2 + 2 = c
3 C = 3

Y = -1x + 3

: y = -x + 3 (1)

Question 19

$Q_{(t)} = \frac{5000}{1+1249e^{-0.33t}}$

When t = 15

$\Longrightarrow \frac{5000}{1+\ 1249e^{-33(15)}}$

$\Longrightarrow \frac{5000}{1+\ 1249e^{495}}$

$\Longrightarrow \frac{5000}{1+8.8472}$

$\Longrightarrow \frac{5000}{9.8472}$

$\Longrightarrow$ 507.76

$\Longrightarrow$ 508

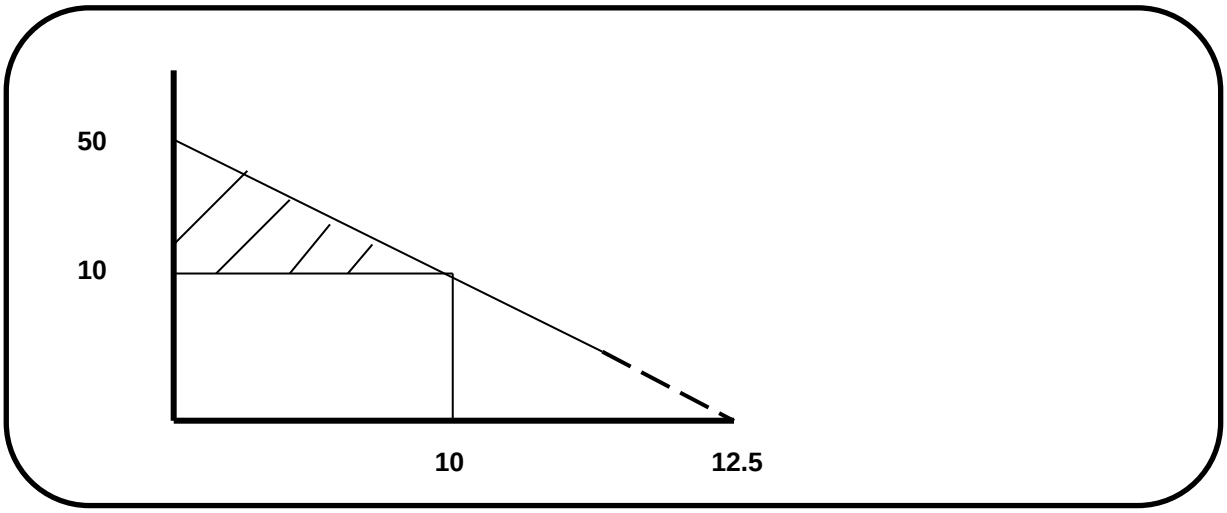
Question 20

Consumer suplus is are above price line, below demand curve.

When q = 0, p = 50

P = 0 , q = 12.5

P = 10 , q = 10



½ x b x h ⟹ ½ x 10 x 40
= 200

Question 21
Available points:
A (0.70)
B(20,60)
C(40,40)
D(60.0)
Plug in the function p = 2x + 30y

A ⟹ 2(0) + 30
B ⟹ 2 (20) + 30(60) = 1840
C ⟹ 2(40) + 30 (40) = 1280
D ⟹ 2(60) + 30(0) = 120 (1)

Question 22
Cost = 2700 + 25x
S.P. = 45x
Break even SP - C = 0

45X - (2700 + 25X) = 0
45X – 2700 – 25X = 0
20X = 2700
X = 135 (3)

QUESTION 23

TC = $\frac{1}{3}Q^3 - 30Q^2$ + 2800Q + 900
MC = Q^2 - 60Q + 2800
When Q = 8
$(8)^2$ - 60 (8) + 2800
64 – 480 + 2800
2384 (1)

Question 24
X +2y – z = 5 …… (1)
2x – y + z = 2 …… (2)
Y + z = 2 …… (3)

From (3) y = 2 – z
Substitute (3) in (1) and (2)

X + 2 (2 – z) – z = 5
2x – (2 – z) + z = 2

X + 4 – 2z – z = 5
2x – 2 + z + z = 2

2 x – 3z = 1
1 2x + 2z = 4

2x – 6z = 2
$\frac{2x}{(-)} + \frac{2z}{-8z} = \frac{4}{-2}$

Z = $\frac{1}{4}$

Y = 2 – 0.25
Y = 7/4

X = 2y – x = 5
X = 5 – 2y + z
= 5 -2(7/4) + (1/4)
= 5 – 7/2 + ¼
X = 7/4

Sum = ¼ + 7/4 + 7/4
= 15/4
= 3.75 (3)

Question 25

$\left(\frac{4L^2}{L^{-2}}\right)^2$

$(4L^2\ L^2)^2$

$(4L^{2+2})^2$

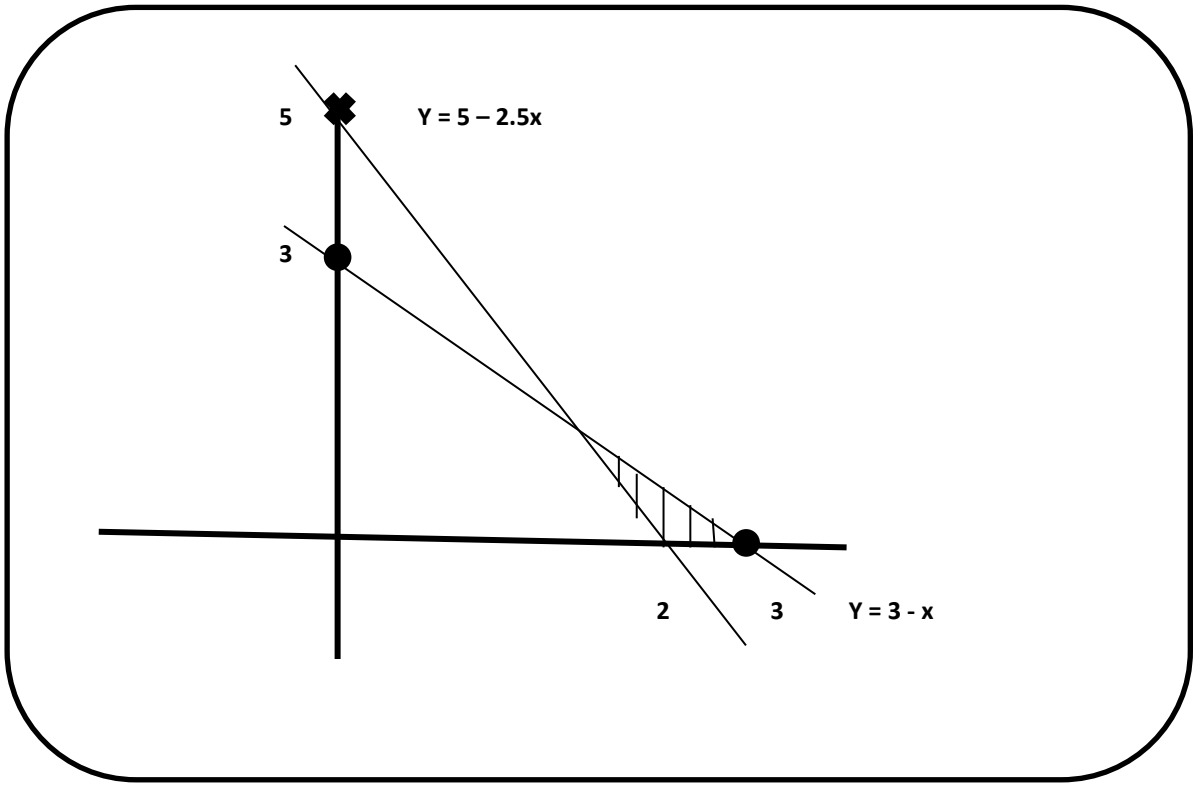
$(4L^4)^2$

$16L^8$ (1)

Question 26

-y ≥ 5 - 2 . 5 x …….. (1)
Y ≤ 3 – x …….. (2)
X,y ≥ 0

	X	0	2	3
1	Y	5	0	-
2	z	3	-	0



(2)

Question 27

Profit (p) = 2500x + 4000y
(1)

Question 28

	2P.B(x)	4PB(y)	Total
Cutting dpt	0.9hrs	1.8hrs	864hrs
Assembly dpt	0.8hrs	1.2hrs	672hrs

: $0.9x + 1.8y \leq 864$
$0.8x + 1.2y \leq 672$
$X,y \geq 0$
(1)

Question 29

Price p (x) = $10 - \frac{1}{1000}$

Cost c(x) = 5000 + 2x

Revenue = price x quantity (x)
= $\left(10 - \frac{x}{1000}\right)$ x x
= $10x - \frac{x^2}{1000}$
= $10x - 0.001x^2$ (3)

Question 30

Equilibrium price and quantity

P = 60 – 0.6Q
P = 20 + 0.2Q

60 – 0.6Q = 20 + 0.2Q
60 – 20 = 0.2Q + 0.6Q
40 = 0.8Q
Q = 50

P = 60 – 0.6 (50)
= 30 (4)

DSC1520 MAY /JUNE 2012

SECTION A
Question 1

2005 $\Longrightarrow$ R1200
2007 $\Longrightarrow \uparrow$ 10%
2010 $\Longrightarrow \uparrow$ 25%

1200 X 10% = 120
1200 + 120
1320

1320 X 25% = 330
1320 + 330
1650 (3)

Question 2

$\frac{x-1}{x^2+5x+11}$ = 0

X – 1 = 0 $(x^2 + 5x + 11)$
X – 1 = 0
X = 1 (2)

Question 3
When it cuts the x – axis @ 4, y = 0 : set of coordinates (4,0) (2,4)
Y = mx + c

M $\Longrightarrow \frac{y_1-y}{x_1-x} \Longrightarrow \frac{4-0}{2-4}$

= $\frac{4}{-2}$

M = -2

Y = mxtc
0 = -2(4) + c
0 = -8 + c
C = 8

Y = -2x + 8 (3)

Question 4
Variable cost = R4X
Fixed cost = R64
Units (X) = 200

TC = FC + VC
= 64 + 4(200)
= 864 (2)

Question 5
P = 40 – Q
Q = 40 – P
$\frac{\Delta Q}{\Delta P}$ = -1

P∈D = $\frac{\Delta Q}{\Delta P}$ X $\frac{P}{Q}$

= - 1 X $\frac{P}{40}$ - P

= $\frac{-P}{40-P}$ = $\frac{P}{P-40}$

QUESTION 6
$3\frac{1}{2}$ X $\frac{3}{4}$ - 2 $\left(\frac{1}{4}+\frac{3}{8}\right)$

$\frac{7}{2}$ X $\frac{3}{4}$ – $\frac{2}{4}$ – $\frac{6}{8}$

$\left(\frac{7}{2}\ X\ \frac{3}{4}\right)$ - ½ - $\frac{3}{4}$

$\Longrightarrow$ $\frac{21}{8}$ - $\frac{1}{2}$ - $\frac{3}{4}$

$\Longrightarrow$ $\frac{11}{8}$ = $1\frac{3}{8}$ (5)

Question 7
X + y - z = 3 …… (1)
2x – y – z = 4 …….. (2)
2x + 2y + z = 12 ……(3)

In (1), x = 3 – y + z
Substitute in (2) and 3
2 (3 – y + z) + 2y + z = 12

6 = 2y + 2z – y – z = 4
6 – 2y + 2z + 2y + z = 12

Z = 3y = -2
3z = 6

3z = 6

Z = 2

Z – 3y = -2

2	– 3y = -2
3	2 + 2 = 3y
4	4 = 3y
5	Y = 4/3

X = 3 – y + z
= 3 – 4/3 + 2
= 7 (2)

Question 8
TC = $10t^2$ - 4t + 14

MC = 20t – 4
= 20(100) – 4
= 1996 (3)

Question 9

$\int_{x=1}^{x=10} \left(\frac{1}{2}x + 1\right)\, dx$

$\frac{1}{4}x^2$ + x

$\left[\frac{1}{4}(10)^2 + 10\right]$ - $\left[\frac{1}{4}\,(1)^2 + 1\right]$

35 – 1.25
33.75 (3)

Question 10

$\frac{a^5\sqrt{a^5}}{2a^{0.3}}$

$\Longrightarrow \frac{a^5.(a^5)^{\frac{1}{2}}}{2a^{0.3}}$

$\Longrightarrow \frac{a^5.(a^5)^{\frac{1}{2}}.a^{-0.3}}{2}$

$\Rightarrow \frac{a^5.a^{\frac{5}{2}}.a^{-0.3}}{2}$

$\Rightarrow \frac{a^{7.2}}{2}$ (3)

Question 11

$log_5 \left(\frac{200}{\sqrt{25}}\right)$

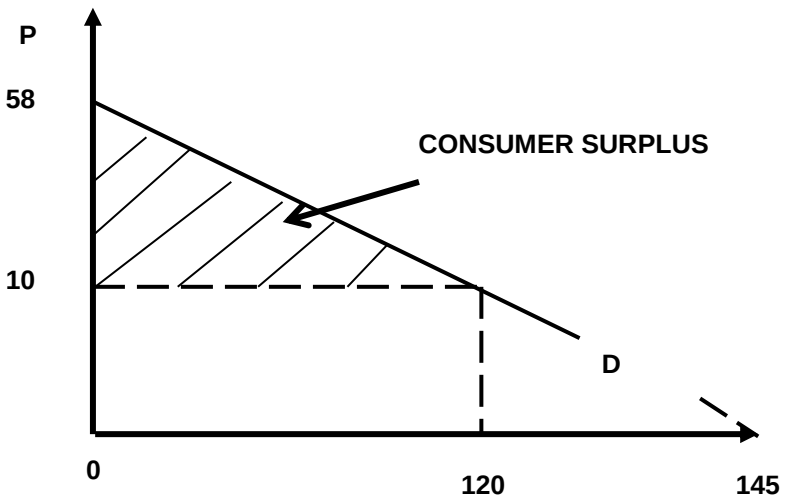
$\Rightarrow log_5 240$

$\Rightarrow \frac{\log 240}{\log 5}$

= 3.40531 (4)

Question 12
P = 58 – 0.4Q
Consumer surplus is the area below demand curve, but above price line.

When q = 0, P = 58
P = 0, Q = 145
P = 10, Q = 120



= 1/2bh
= ½ x 120 x 48
= 2880 (3)

Question 13

$\int (x^2 + 2x^3)$ dx

$\frac{x^3}{3} + \frac{x^4}{2}$ + c (2)

Question 14
B (t) = $\frac{8500}{1+ 15e^{-0.4t}}$

After 4hrs

B = $\frac{8500}{1+ 15E^{-0.4(4)}}$

= $\frac{8500}{1+ 15e^{-1.6}}$

= $\frac{8500}{1+3.02845}$

= 21 09.99 (2)

Question 15
Maximum value of function
F = 6P + 20D

Available points
(a) $\left(\frac{p}{0}, \frac{D}{20}\right)$
(b) $(6,16)$
(c) $(6,12)$

: F = 6(0) + 20 (20) = 400
OR $\Longrightarrow$ 6(6) + 20(16) = 356
OR $\Longrightarrow$ 6(6) + 20 (12) = 276

: Max value is 400 (3)

Question 16
F (x) = x $(x^2 + 3x)$
= x^3 + $3x^2$

$f^1\ (x)$ = $3x^2$ + 6x (1)

Question 17
Roots od function y = x^2 + x – 6

x^2 - 2x + 3x – 6
X (x -2) +3 (x -2)
(x +3) (x – 2) = 0
X = -3 or 2 (1)

Question 18
Y – intercept of function
- 4y = $-2x^2$ + x -8

Y = $\frac{1}{2}x^2$ - $\frac{1}{4x}$ + 2
When x = 0 , y = 2 (4)

Question 19
Y = + 10x – 8
To maximize profit , find the derivate ;
y^1 = -4x + 10
0 = -4 x + 10
4x = 10
X = 2.5
: approximately 3 units (2)

Question 20
Y = $3x^2$ - 12x + 6 value of x for which the function has the min/ max value , find the derivative of the function.

y^1 = $3x^2$ - 12

$3x^2$ - 12 = 0
x^2 - 4 = 0
x^2 = 4
$\sqrt{x^2}$ = $\sqrt{4}$

X = $\pm$ 2 (3)

SECTION B
Question 21

		chairs	
	Dinning (x)	Lounge (y)	Total hours
Sanding	2hrs	2hrs	78hrs
Staining	4hrs	3hrs	96hrs

: $2x + 2y \leq 78$
$4x + 3y \leq 96$
$X,y \geq 0$

Question 22
$S(t) = 1800 + 1500\ e^{-0.3t+0.5}$
$2000 = 1800 + 1500\ e^{0.3t+0.5}$
$2000 = 1800 + 1500\ e^{-0.3t+0.5}$
$200 = 1500e^{0.3t+0.5}$

$2 = 15\ e^{-0.3t+0.5}$
$\frac{2}{15} = e^{-0.3t+0.5}$

$\ln\left(\frac{2}{15}\right) = \ln e^{-0.3t+0.5}$

$\ln\left(\frac{2}{15}\right) = -0.3t + 0.5$
$\ln\left(\frac{2}{15}\right) = -0.3t + 0.5$
$0.3t = 0.5 - \ln\left(\frac{2}{15}\right)$

$T = \frac{0.5 - \ln\left(\frac{2}{15}\right)}{0.3}$

$T = \frac{0.5-(-2.0149)}{0.3}$

$= \frac{2.5149}{0.3}$

$= 8.383$

: approximately 8 months

Question 23
$25x + 40y \geq 2000$
$10x + 4y \geq 400$
$Y = \geq 40$

X,y ≥ 0

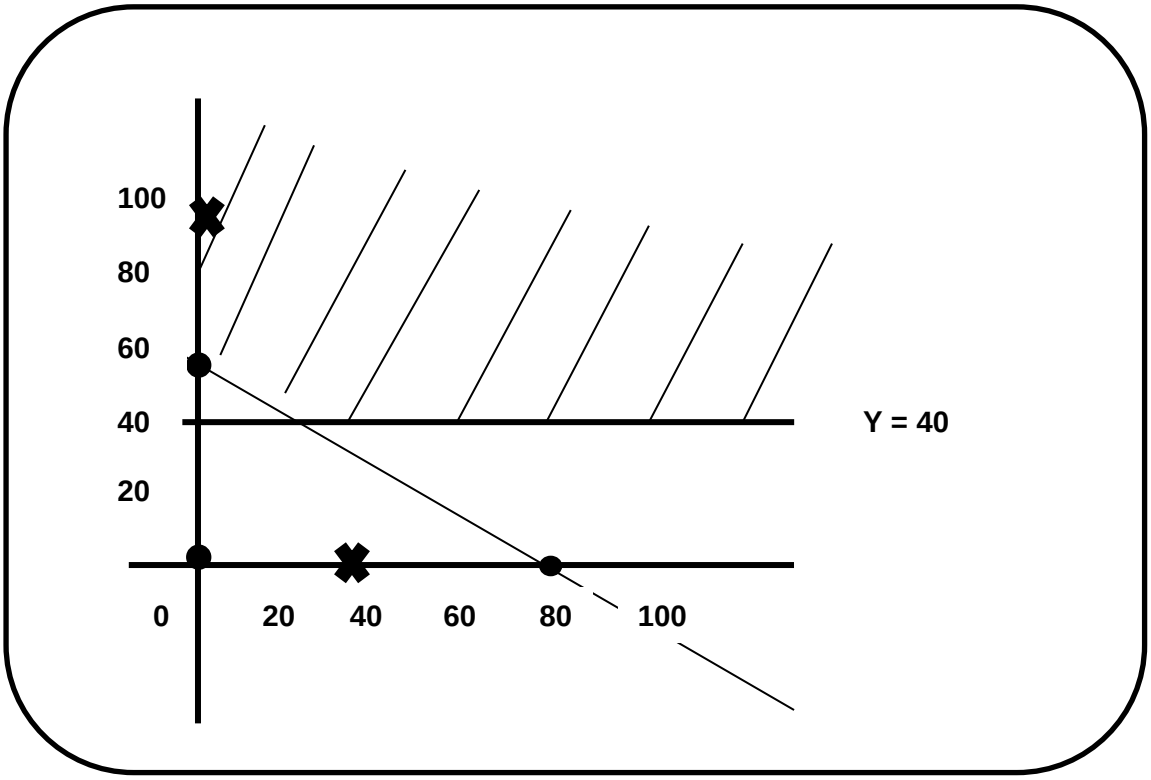
Equations thereof :
25x + 40y = 2000
40y = 2000 – 25x
Y = 50 – 5/8x ….. (1)

10x + 4y = 400
4y – 400 – 10x
Y = 100 = 5/2x …. (2)

Y = 40

For (1) , when x = 0, y = 50
When y = 0,x = 80

For (2) when x = 0 , y = 100
When y = 0 , x = 40



Question 24

(a) Equilibrium price quantity

P_d = 50 – 0.6 Q &

P_S = 20 + 20 + 0.4Q

50 – 0.6Q = 20 + 0.4Q
50 – 20 = 0.4Q + 0.6Q
30 = Q

P = 50 – 0.6(30)
= 50 – 18
P = 32

(b) PED = $\frac{\Delta Q}{\Delta P}$ X $\frac{P}{Q}$

Pd = 50 – 0.6Q
0.6Q = 50 – P
Q = $\frac{250}{3}$ - $\frac{5}{3}$P

= $\frac{\Delta Q}{\Delta P}$ = - $\frac{5}{3}$

: PED = - $\frac{5}{3}$ X $\frac{P}{\frac{250}{3}}$ $-5/3P$

= $\frac{-\frac{5}{3}P}{\frac{250}{3}-\frac{5}{3}P}$

Divide all by (-/3)

= $\frac{P}{-50+P}$

= $\frac{P}{P-50}$

QUESTION 25
PROFIT = SP = costs
= 10Q – (450 + 5Q)
= Q – 450 – 5Q
= 5Q – 450
Profit = 5Q – 450

If profit = R225

: 225 = 5Q – 450
225 + 450 = 5Q
675 = 5Q
Q = 135

(C) To break – even , no loss, no profit , thus profit = 0

: 0 = 5Q – 450
450 = 5Q
Q = 90units

OCTOBER/NOVEMBER 2011

SECTION A

1. 15% decrease means the percentage is now 85% (100 – 15)
   : 85% = 425
   Thus 100% = ?

   $\frac{100}{85}$ x 425

   500 (4)

2. $\frac{2}{3} \div \frac{1}{2}$ - 2 + $\frac{2}{4}$ $\left(-\frac{1}{2} + 2\frac{1}{6}\right)$

   $\frac{4}{3}$ - 2 + $\left(-\frac{1}{4} + \frac{13}{12}\right)$

   $\frac{4}{3}$ - 2 - $\frac{1}{4}$ + $\frac{13}{12}$

   $\frac{1}{6}$ (3)

Question 3

Y = intercept (c) = 3
Parallel to y = 4x + 1 , thus , the gradient is the same = 4

: y = 4x + 3 (3)

Question 4
X = intercept of
2x = 5y - 5
X = $\frac{3y}{2}$ - $\frac{5}{2}$

X = intercept = - $\frac{5}{2}$ (4)

Question 5
Q = 6000 – 30P
C = 72000 + 60Q

Rev = price x quantity

Rev = p x (6000 – 30p)
= 6000p - $30p^2$

Question 6

P = 60 – 2.5Q

PED = $\frac{\Delta Q}{\Delta P}$ X $\frac{P}{Q}$

2.5Q = 60 – P

Q = 24 - $\frac{2}{5}$ P

$\frac{\Delta Q}{\Delta P}$ = - $\frac{2}{5}$

PED = - $\frac{2}{5}$ X $\frac{P}{24-2/5P}$

= $\frac{-2/5P}{24-2/5P}$ divide all by -2/5

= $\frac{p}{-60+p}$

= $\frac{p}{p-60}$

When p = 10

$\frac{10}{10-60}$

= -0.200 (4)

Question 7

$\left(\frac{3L^{0.5}}{L-2}\right)^2$

$(3L^{0.5}.L^2)^2$

3^2 . $L^{0.5\ X\ 2}$. L^{2X2}

9 . L. L^4

$9L^{1+4}$

$9L^5$

Question 8

Pd = 400 – 5 5Qd

Ps = 3Q + 24

Equilibrium P and Q

400 – 5Q = 3Q + 24
400 – 24 = 3Q + 5Q
376 = 8Q
Q = 47

P = 400 – 5(47)
P = 165 (1)

Question 9
X + 2y – z = 5 …… (1)
2x – y + z = 2 …….. (2)
Y + z = 2 …… (3)

From (3), y = 2 – z
Substitute y in (1) and (2)

X + 2 (2 – z) – z = 5
2x – (2 – x) + z = 2

X + 4 -2z – z = 5
2x – 2 + z +z = 2

$$\begin{matrix} 2 \\ 1 \end{matrix} \begin{cases} x-3z=1 \\ 2x+2z=4 \end{cases}$$

- 2x – 6 z = 2

$2x + \frac{2z}{-8z} = \frac{2}{-2}$

Z = ¼ or 0.25

Y = ¼ = 2
Y = 2 – ¼
Y = 1.75 or 7/4

X = 1 + 3z
X = 1 + 3 (0.25)
X = 1.75 or 7/4

X = 1.75 , y = 1.75 , z = 0.25 (4)

Question 10
Consumer surplus is the area above the price line, but below the demand curve

P = 80 – 2.5Q
When P = 0, Q = 32
Q = 0, P = 80
When P = 15 , Q = 26

: base = 26 , height = 65 (80 – 15)

½ bh
½ x 26 x 65
= 845 (3)

Question 11
Y = x^2 + x - 6
x^2 - 2x + 3x – 6 = 0
X(x – 2) +3 (x -2) = 0
(x -2) (x +3) = 0
(X = 2) (x + 3) = 0
X = 2 or -3 (1)

Question 12
When Q = 50 , P = 6 (50,6)
Q = 90 , P = 11 (90,11)

Gradient (m) = $\frac{11-6}{90-50}$ = $\frac{5}{40}$ = $\frac{1}{8}$

M = 0.125

Y = mx + c
11 0.125 (90) + c
11 = 11.25 + c

11 – 11.25 = c
C = -0.25

Y = mx + c ⇔ P= MQ + c
P = 0.125Q - 0.25 (1)

Question 13

$log_5 \left(\frac{1200}{\sqrt{25}}\right)$ = log_5 (240)

= $\frac{log 240}{\log 5}$

= 3.4053 (2)

Question 14

Q(t) = $\frac{5000}{1+\ 1249e^{-\ 0.33t}}$

When t = 15

= $\frac{5000}{1+\ 1249e^{-0.33(15)}}$

= $\frac{5000}{1+ 1249e^{-4.95}}$

= $\frac{5000}{9.8472}$

= 507.76

= 508 (2)

Question 15

F(x) = $3x^6$ + x^4 + $\sqrt{x}$ + 300

= $3x^6$ + x^4 + $x^{\frac{1}{2}}$ + 300

f^1 (x) = $18x^5$ + $4x^3$ + $\frac{1}{2}x^{-\frac{1}{2}}$ (4)

Question 16

P(x) = $-x^2$ + 6x + 7
= -2x + 6

0 = -2x + 6
2x = 6
X = 3

$-(3)^2$ + 6(3) + 7
- 9 + 18 + 7
16
R16million (4)

Question 17
P = 20 – 0.2Q
PED = $\frac{\Delta Q}{\Delta P}$ X $\frac{P}{Q}$

0.2Q = 20 – P
Q = 100 – 5P

$\frac{\Delta Q}{\Delta P}$ = -5

: -5 X $\frac{P}{100-5P}$

$\frac{-5P}{100-5P}$ divide by -5

$\frac{p}{-20+P}$ divide by -5

$\frac{P}{-20+P}$

= $\frac{P}{P-20}$ (1)

Question 18
TC = $2Q^3$ - Q^2 + 80Q + 150

MC = TC^1 (Q)

= $6Q^2$ - 2Q + 80

When Q = 10

$6(10)^2$ - 2(10) + 80
600 – 20 + 80
When Q = 10

$6\,(10)^2$ - 2 (10) + 80
600 – 20 + 80
660 (3)

Question 19

$\int(2x + 4x^3)$ dx

$\frac{2x^{1+1}}{1+1} + \frac{4x^{3+1}}{3+1}$

$\frac{2}{2} x^2 + \frac{4}{4} x^4$

$x^2 + x^4 + c$ (4)

Question 20

$\int_{x=0}^{x=4}(x^3 + 2x)$dx

$\frac{x^4}{4} + x^2$

$\left(\frac{(4)^4}{4} + 4^2\right) \left(\frac{(0)^4}{4} + 0^2\right)$

(64 + 16)

80 (1)

SECTION B

Question 21

	Zombie(x)	Skyjack(y)	Total
Vodka	3l	5l	1500l (max)
Vermouth	6l	3l	1500l(max)
Ginger	1l	2l	400l(min)

: $3x + 5y \leq 1500$
$6x + 3y \leq 1500$
$X + 2y \geq 400$
$X , y \geq 0$

Question 22
$N = 125.5e^{0.12t}$

$200 = 125.5e^{0.12t}$

$\frac{400}{251} = e^{0.12t}$

In $\left(\frac{400}{251}\right) = \text{In } e^{0.12t}$

In $\left(\frac{400}{251}\right)$ = 0.12t

T = In ( ) ÷ 0.12

= 3.88

: after approximately 4 days

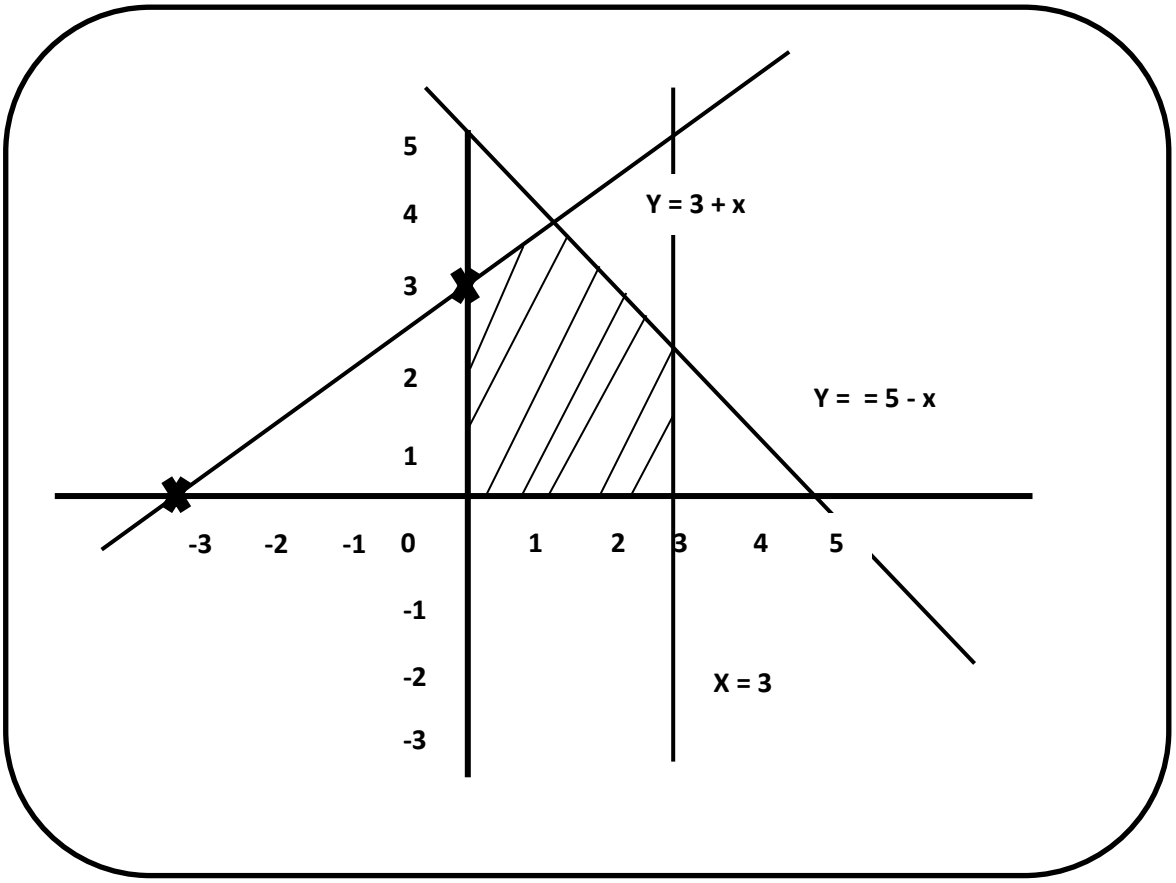
Question 23

(a) –x + y ≤ 3
(b) X + y ≤ 5
(c) X ≤ 3
X,y ≥ 0

The equations :
-x + y = 3 ……. (1)
X + y = 5 ……. (2)
X = 3 …… (3)
X,y = 0

In (1) , when x= 0 , y = 3
Y = 0, x = -3

In (2), when x = 0, y = 5
When y = 0, x = 5



(b)Maximum value of
P = 2X + 4Y

Available points:
(0.3), (1.4), (3.2) and (3.0)

2(0) + 4(3) = 12
2(1) +4(4) = 18
2(3) +4(2) = 14
2(3) +4(0) =6

Maximum value (P) = 18

Question 24

(a) Total Revenue = P X Q
R = 350Q

Total cost = FC + VC
TC = 10000 + 150Q

Profit = Revenue – cost
= 350Q = (10 000 + 150Q)
= 350Q – 10 000 – 150Q
= 200Q - 10 000

(b) Break – even Quantity : profit = 0
: 200Q – 10 000 = 0

$\frac{200Q}{200} = \frac{10\,000}{200}$

Q = 50

(C) For a loss of R20 000:

- 2000 = 200Q – 10 000
- 2000 + 10 000 = 200Q

$\frac{8000}{200} = \frac{200Q}{200}$

Q = 40lamps

Question 25
Y = $-x^3 + 9x^2$ - 24x + 26
For max or min value , $y^1 = 0$

: $y^1 = 3x^2$ + 18x – 24
0 = $-3x^2$ + 18x – 24
$3x^2$ - 18x + 24 = 0
x^2 - 6x + 8 = 0
x^2 - 2x – 4x + 8 = 0
X (x -2) – 4 (x – 2) = 0
(x -2) (x - 4) = 0
X = 2 or 4