Subject: Mathematics.

Q1- (i)solution

5/2+10/3÷7/4

$=\frac{15+20}{6}$x4/7 =35/6x4/7=5/3x2

=10/3 Ans (2mks)

(ii)solution

9x(x+1)=4

$9x^2+9x-4=0$

(3x+1)(3x-4)=0

Either 3x+1=0 or 3x-4=0

X=-1/3 or x=4/3Ans(2mks)

Q2-(a) solution

Log4/log8= $\log 2^2/\log 2^3$

=2log2/3log2 =2/3Ans (2mks)

(b)solution

$3\sqrt{12}$ -2$\sqrt{3}$

=3$\sqrt{4}$ x $\sqrt{3}$ -2$\sqrt{3}$ =6$\sqrt{3}$ -2$\sqrt{3}$

=4$\sqrt{3}$Ans (2mks)

Q3-(a)-solution:

Sinα=0.5

α=Sin^{-1}=0.5 =30^0,150^0Ans (2mks)

(b)-Solution:

$(16/81)^{-3/4}$ =$(3/2)^{4x3/4}$

=$(3/2)^3$ =27/8 Ans (1mks)

(c)Solution

$Log_x8=3$

$X^3=8$ $X^3=2^3$ X=2 Ans (1mk)

Q4-(a)Solution:

X/2-2 ≥ 2X=8

X-4 ≥ 4X+16

(b)Solution

$(0.0315)^2 - (0.0185)^2$

=(0.0315 + 0.0185)(0.0215 -0.0185)

$X-4X \geq 16+4$

$-3X \geq 20$

$X \leq -20/3$ Ans (2mks)

$=0.05 \times 0.013 \quad =0.00065$

≈ 0.001 Ans (2mks)

Q5-(a)Solution:

$\begin{pmatrix} 3 & -1 \\ 20 & y \end{pmatrix} \begin{pmatrix} X \\ -1 \end{pmatrix} = \begin{pmatrix} 7 \\ 20 \end{pmatrix}$

$\begin{pmatrix} 3x+1 \\ 20X-y \end{pmatrix} = \begin{pmatrix} 7 \\ 20 \end{pmatrix}$

$3X + 1 = 7$----------(i)

$3X = 7 - 1 \quad =6 \quad x = 6/3 \quad =2$

Substituting X = 2in equation (ii)

$20 \times 2 - y = 20$

$40 - y = 20$

$X = 2, y = 20$ Ans (2mks)

Q6-(i)Solution

$P + q = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix} + \begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix}$

$P + q = \begin{pmatrix} 0 & 9 \\ 9 & 7 \end{pmatrix}$ Ans (2mks)

(ii)Solution

$Pq = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix} \begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix}$

$= \begin{pmatrix} -4+24 & 10+4 \\ -6+36 & 15+6 \end{pmatrix}$

$Pq = \begin{pmatrix} 20 & 14 \\ 30 & 21 \end{pmatrix}$ Ans (2mks)

Q7-(a)Solution

$AB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(3+1)^2+(4-2)^2}$

$= \sqrt{4^2+2^2} \quad = \sqrt{16+4}$

$= \sqrt{20}$

Length $AB = 2\sqrt{5}$ units Ans (2mks)

(b)Solutin:

the Slope of AB = $Y_2 - Y_1 / X_2 - X_1$

$= 4 - 2/3 + 1 \quad = 2/4 \quad = 1/2$

the slope of AB =1/2 Ans (2mks)

Q9-(a)Solution

$X + Y = 8$-----------(i)

$XY = 15$------------(ii)

$Y = 8 - X$

Substituting $Y=8-X$ in equaton (ii)

$X(8 - X) = 15$

$8X - X^2 = 15$

$X^2 - 8X + 15 = 0$

$(X-3)(X-5) = 0$

Either $X - 3 = 0$ or $X - 5 = 0$

$X = 3$ or $X = 5$ Ans (2mks)

(b)Solution

$a = -3$, $b = 1$ and $r = 5$

Using $(X-a)^2+(Y-b)^2 = r^2$

$(X+3)^2+(Y-1)^2 = 5^2$

$X^2 + 6X + 9 + Y^2 - 2Y + 1 = 25$

$X^2 + Y^2 + 6X - 2Y + 10 - 25 = 0$

The required equation of the circle is

$X^2+Y^2+6X-2Y-15 = 0$ Ans (2mks)

Q9-(i)Solution

Let S={1,2,3,4,5,6} and A={1,2,3,4}

Using P(A) =n(A)/n(S) =4/6 =2/3

P(A) =2/3 Ans (2mks)

(ii)Solution

Let S ={1,2,3,4,5,6}

A={1,3,5}

B={4,6}

Using P(AUB) =n(A)/n(S) +n(B)/n(S)

=3/6+2/6 =3+2/6 =5/6

P{AUB)= 5/6 Ans (2mks)

Q10-(i)Solution:

Area of trapezium =1/2xheightxsum of two parallel sides

=1/2x7x(18+14)

=1/2x7x32 =7x16 =112

Area of the trapezium $=112cm^2$ Ans (2mks)

(ii)Solution:

$(1+X)^5=1+5x+10x^2+10x^3+5x^4+x^5$

Ans (2mks)

SECTION (B) (60 MARKS)

Given that f(X) =3-2x , g(x) =X^2+1

Q11-(i)Solution:

[f+g](2) = f(2) +g(2)

=(3-4) + (4+1)

=-1+5 =4

[f+g](2) =4 ans (2mks)

(ii)Solution

[f-g](2) = f(2) – g(2)

=(3-4) –(4+1)

=-1-5 = -6

[f-g](2) = -6Ans (2mks)

(iii)Solution:

F[g(2)] g(2)=2^2+1=4+1=5

F[g(2)]=f(5) = 3- (2x5) =3-10 =-7

F[g(2)] =-7 Ans (3mks)

(iv)Solution f(2) =3-2(2) =3-4 -1

g[f(2)] =g(-1) =$(-1)^2$+1 =1+1 =2

g[f(2)] =2 ans (3mks)

(v)Solution:

g'(x) =x^2+1

g'(x) =2x Ans (2mks)

Q12-(a)Solution:

height	Frequency	X	fX
0-2	10	1	10
3-5	9	4	36
6-8	6	7	42
9-11	4	10	40
12-14	1	13	13
	∑f=30		∑fx=141

Using $\overline{x}$ =∑fx/∑f =141/30 =4.7cm Ans (6mks)

(b)Solution:

Using $T_n=ar^{n-1}$

Given $T_3=9$ and $T_6=243$

$ar^2=9$---------------------(i)

$ar^{5}=243$------------------(ii)

Divide equation(ii) by equation (i)

$Ar^5/ar^2 = 243/9 \quad =27$

$R^3=3^3 \quad r= 3$

Substituting r =3 in equation (i)

9a = 9 a =9/9 a = 1

The first term = 1 and the common ratio = 3

Ans (6mks)

Q13-(a) (i) Solution:

$Y=X^{-1} + 5 \text{ Sin}X$

$\frac{dy}{dx}$ =-X-2 +5CosX

$\frac{dy}{dx}$ $=-1/X^2 + 5\cos X$ ans (3mks)

(ii)Solution:

$u=5x^3$, $du/dx =15X^2$, V=X+1, dv/dx=1

Using; $\frac{dy}{dx}$ =Vdu/dx-Udv/dx/V2

$=(X+1)(15X^2)-(5X^3)(1)/(X+1)^2$

$=15X^3+15X^2 -5X^3/(X+1)^2$

$\frac{dy}{dx}$ $=10X^3+15X^2/(X+1)^2$Ans (3mks)

(b)–(i)solution:

$\int(x - x^{-2})$dx $=x^2/2+x^{-1}+c$

$=x^2/2 +1/x$ +cans(3mks)

(ii)-solution

$\int(3x+1)dx$ $=3/x^2/2+x$ + cans (3mks)

Q14 Given $Z_1=6+2i$ and $Z_2=1+i$

(i)-solution

$Z_1 +Z_2 = 6 +2i +1 +I$

(ii)-solution

Z – Z = (6 + 2i)- (1 +i)

(iii)- solution $Z_1 Z_2 = (6 +2i)(1+i)$

=6 +6i+2i-2

$= 7+ 3i$ ans(2mks) $=5+I$ ans (2mks) $= 4 +8i$ ans (3mks)

(iv)Solution:

X=4 , Y=8

$IZ_1Z_2I = \sqrt{x^2 + Y^2} = \sqrt{4^2 + 8^2} = \sqrt{16 + 64} = \sqrt{80} = \sqrt{16} \times \sqrt{5} = 4\sqrt{5}$ans (3mks)

(v) solutiontanΘ = Y/x = 8/4 = 2

Arg$Z_1Z_2 = \tan\Theta^{-1}(2)$ ans. (2mks)

Q15. (a) solution $Y = 2x^5 - x^{-2} - 3x + 5$

$\frac{dy}{dx} = 10x^4 + 2x^{-3} - 3$

$\frac{dy}{dx} = 10x^4 + \frac{2}{x3} - 3$ ans. (4mks)

(b) solution $Y + X^2 - 3x + 4$

$\frac{dy}{dx} = 2x - 3$

At x = 1 $\frac{dy}{dx} = 2(1) - 3 = 2 - 3 = -1$ ans (4mks)

(c) solution $Y = 3X^2$

$\frac{dy}{dx} = = 6x = 6x3 = 18$

Using $\frac{Y-Y1}{X-X1} = \frac{dy}{dx}$

Where $X_1 = 3, Y_1 = 27$ and $\frac{dy}{dx} = 18$

$\frac{Y-27}{X-3} = 18$ Y-27 =18(x -3)

Y – 27 = 18X -54

18X + y -27 + 54 = 0 The equation of the tangent is 18x +Y + 27 =0 ans (4mks)

Q16 (a) solution

P = 25,000 SSP r = 18% t = 3 ½ years

Using I = Prt   I = 25,000 X 18 X 3.5/100

I = 1575000/100

I = 15750 ans   (4mks)

(b)   solution

P ∝ 1/q   P = k/q   k= pq = 4 x 5 = 20

P = 20 /q at q = 10   p = 20/10 = 2 P = 2   ans   (4mks)

(c) solution

Given 6 + 9 +12 + ----------

a = 6 d = 9-6 = 3 S_n = 132

usingS_n= n/2 [2a + (n-1)d]   n/2 [2x6 +3(n-1)] = 132

n/2 [12 +3n -3] = 132   n(9+3n) – 264 =0

$3n^2$ + 9n -264 =0 n^2 +3n -88 = 0

Either n +11 = 0   or n -8 = 0   n = -11   or n = 8

The number of the terms of arithmetic is 8 terms ans   (4mks)

Q17. (a)Solution $\int_1^2 (x3 + x)dx$

= $[X^4/4 + X^2/2]_1^2$ = $(2^4/4 + 2^2/2)$ - (1 /4 + 1 /2)

16/4 + 4/2 - (1+2)/4 = 16+8 – 3 /4   = 21/4ans   (4mks)

(b)isolutionIbI=$\sqrt{(-1)^2 + (4)^2}$ = $\sqrt{9 + 16}$ =$\sqrt{25}$ = 5 units   ans   (2mks)

ii. solution

a + b = $\begin{bmatrix}5\\6\end{bmatrix}$ + $\begin{bmatrix}-3\\4\end{bmatrix}$ = $\begin{bmatrix}5-3\\6+4\end{bmatrix}$ = $\begin{pmatrix}2\\10\end{pmatrix}$

Ia+bI = $\sqrt{2^2+10^2}$ = $\sqrt{4+100}$ = $\sqrt{104}$ units ans (2mks)

(c) solution

Given $\frac{dy}{dx}$ = 3 – 2x^2 Y = $\int(3-2x2)dx$

Y = 3x – 2/3X^3+c at X = 0 , Y = 0, C= 0

The equation of the curve is Y = 3x – 2/3X^{3}ans (4mks)