VPMP POLYTECHNIC, GANDHINAGAR

MATHEMATICS (SEM-1)

COURSE CODE: - 4300001

ASSIGNMENT

UNIT-I

MARKS-16

DETERMINANT

&

FUNCTION

DETERMINANT

- **MQC'S**

1) $\begin{vmatrix} 2 & -3 \\ 5 & 4 \end{vmatrix} =$

2) $\begin{vmatrix} 4 & 3 \\ -2 & -1 \end{vmatrix} =$

3) If $\begin{vmatrix} x & 1 \\ 4 & 2 \end{vmatrix} = 0$ then $x =$ _____.

4) If $\begin{vmatrix} x & 3 \\ -2 & 2 \end{vmatrix} = 2$ then $x =$ _____.

5) If $\begin{vmatrix} 2 & x \\ -3 & 5 \end{vmatrix} = 13$ then $x =$ _____.

6) If $\begin{vmatrix} x & -3 \\ y & 3 \end{vmatrix} = 9$ then $x + y =$ _____.

7) If $\begin{vmatrix} x-2 & 3 \\ 0 & x+2 \end{vmatrix} = 0$ then $x =$ _____.

8) $\begin{vmatrix} \log 1 & x \\ 0 & y \end{vmatrix} =$_____.

9) $\begin{vmatrix} 1 & \log_y x \\ \log_x y & 1 \end{vmatrix} =$_____.

10) $\begin{vmatrix} \log_6 3 & -1 \\ \log_6 2 & 1 \end{vmatrix} =$_____.

11) $\begin{vmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{vmatrix} =$_____.

12) $\begin{vmatrix} \sec\theta & \tan\theta \\ \tan\theta & \sec\theta \end{vmatrix} =$_____.

13) $\begin{vmatrix} \log_e e & \log_{10} 10 \\ 4 & 4 \end{vmatrix} =$ _____.

14) If $D = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ then co-factor of $5 =$ _____.

15) If $D = \begin{vmatrix} 1 & -2 & 4 \\ 0 & 3 & 5 \\ -1 & 2 & 6 \end{vmatrix}$ then co-factor of $0 =$ _____.

➢ **EXAMPLES**

1) Solve $\begin{vmatrix} x+1 & 2 \\ 2 & x-2 \end{vmatrix} = 0.$

2) Solve $\begin{vmatrix} x & 3 \\ 4 & x \end{vmatrix} = \begin{vmatrix} 0 & -2 \\ 2x & 5 \end{vmatrix}$

3) Evaluate $\begin{vmatrix} 2 & 6 & -3 \\ 1 & 2 & 0 \\ 3 & 4 & -2 \end{vmatrix}$

4) Evaluate $\begin{vmatrix} 3 & 2 & 5 \\ 0 & -2 & 1 \\ 4 & 1 & 6 \end{vmatrix}$

5) Evaluate $\begin{vmatrix} 0 & -x & -y \\ x & 0 & z \\ y & -z & 0 \end{vmatrix}$

6) Evaluate $\begin{vmatrix} a & b & c \\ 1 & 2 & 1 \\ a & b & c \end{vmatrix}$

7) Solve $\begin{vmatrix} 4 & 3 & 9 \\ 2 & 7 & 3 \\ 1 & x & 2 \end{vmatrix} = 2$

8) If $\begin{vmatrix} x-2 & 2 & 2 \\ -1 & x & -2 \\ 2 & 0 & 4 \end{vmatrix} = 0$ then find the value of x.

9) Evaluate $\begin{vmatrix} a & b+c & 1 \\ b & c+a & 1 \\ c & a+b & 1 \end{vmatrix}$

10) Find the value by sarrus's Method $\begin{vmatrix} 2 & 3 & -1 \\ 4 & 0 & 5 \\ -3 & 2 & 4 \end{vmatrix}$

11) Expand $\begin{vmatrix} 5 & 3 & -1 \\ 4 & -3 & 0 \\ 6 & 1 & 2 \end{vmatrix}$ using sarrus's Method.

LOGARITHM

- **MCQ'S**

1) If $\log_7 x = 1$ then $x =$ _____.
2) If $\log_2 x = 5$ then $x =$ _____.
3) If $\log_a 32 = 5$ then $a =$ _____.
4) $\log m - \log n =$_____.
5) $\log a + \log\left(\frac{1}{a}\right) =$_____.
6) $\log(\tan\theta) + \log(\cot\theta) =$_____.
7) $\log 81 \div \log 27 =$_____.
8) $\log 32 \div \log 16 =$_____.
9) $\log 27 \div \log 9 =$_____.
10) $\log_{15} 1 =$ _____.
11) $\log 1 \cdot \log 2 \cdot \log 3 \cdot \log 4 \cdot \log 5 =$ _____.
12) $\log_2 8 =$_____.
13) $\log_5 125 =$ _____.
14) Value of $\log_a\left(\frac{1}{a}\right) =$ _____.
15) $\log_{10} 0.0001 =$ _____.
16) $\log_4\left(\frac{1}{2}\right) =$ _____.
17) $a^{\log_a b} =$ _____.
18) $1024^{\log_2 m} =$ _____.
19) $\log_b a \times \log_a b =$ _____.
20) If $\log x + \log 2x = \log 18$ then $x =$ _____.
21) If $\log_{10}(x+1) + \log_{10}(x-1) = \log_{10} 3$ then $x =$ _____.
22) If $\log_3(\log_2 x) = 1$ then $x =$ _____.

➢ **EXAMPLES**

1) Evaluate $\log\left(\frac{25}{32}\right) + \log\left(\frac{225}{64}\right) + \log\left(\frac{128}{25}\right) + \log\left(\frac{32}{450}\right)$.

2) Evaluate $\log\left(\frac{a-b}{b-c}\right) + \log\left(\frac{b-c}{c-a}\right) + \log\left(\frac{c-a}{a-b}\right)$.

3) Prove that $2\log\left(\frac{6}{7}\right) + \frac{1}{2}\log\left(\frac{81}{16}\right) - \log\left(\frac{27}{196}\right) = \log 12$.

4) Simplify $\log 2 + 16\log\left(\frac{16}{15}\right) + 12\log\left(\frac{25}{24}\right) + 7\log\left(\frac{81}{80}\right)$.

5) Prove that $\log\left(x + \sqrt{x^2 - 1}\right) + \log\left(x - \sqrt{x^2 - 1}\right) = 0$.

6) Prove that $\log\left(\sqrt{x^2 + 1} + x\right) + \log\left(\sqrt{x^2 + 1} - x\right) = 0$.

7) Prove that $\frac{1}{\log_2 6} + \frac{1}{\log_3 6} = 1$.

8) Prove that $\frac{1}{\log_6 24} + \frac{1}{\log_{12} 24} + \frac{1}{\log_8 24} = 2$.

9) Prove that $\log_a p + \log_{a^2} p^2 + \log_{a^3} p^3 + \log_{a^4} p^4 = 4\log_a p$.

10) Prove that $\frac{1}{\log_{xy}(xyz)} + \frac{1}{\log_{yz}(xyz)} + \frac{1}{\log_{zx}(xyz)} = 2$.

11) Prove that $\frac{1}{\log_x yz+1} + \frac{1}{\log_y zx+1} + \frac{1}{\log_z xy+1} = 1$.

12) Prove that $\log_b a \cdot \log_c b \cdot \log_a c = 1$.

13) If $\log\left(\frac{a+b}{2}\right) = \frac{1}{2}(\log a + \log b)$ then prove that $a^2 + b^2 = 2ab$.

14) If $\log\left(\frac{a+b}{2}\right) = \frac{1}{2}(\log a + \log b)$ then prove that $a = b$.

15) If $\log\left(\frac{x+y}{3}\right) = \frac{1}{2}(\log x + \log y)$ then prove that $x^2 + y^2 = 7xy$ or $\frac{x}{y} + \frac{y}{x} = 7$.

16) If $\log(x + y) = \log 3 + \frac{1}{2}\log x + \frac{1}{2}\log y$ then prove that $x^2 + y^2 = 7xy$.

17) If $\frac{4\log 3 \times \log x}{\log 9} = \log 27$ then find value of x.

18) If $\frac{\log x \times \log 16}{\log 32} = \log 256$ then find value of x.

19) Solve $\log(x) + \log(x - 5) = \log 6$.

20) Solve $\log_2(x + 5) + \log_2(x - 2) = 3$.

21) Solve $\log_2(\log_3(\log_2 x)) = 1$.

FUNCTION

- **MCQ'S**

1) If $f(x) = x^2 - 1$then $f(-1) =$ _____.
2) If $f(x) = x^3 - 1$then $f(2) + f(-3) =$ _____.
3) If $f(x) = 2^x - x^2$then $f(2) =$ _____.
4) If $f(x) = 2^x - \log_2 x$then $f(2) =$ _____.
5) If $f(x) = \log x$then $f(1) =$ _____.
6) If $f(x) = \log_x 1$then $f(100) =$ _____.
7) If $f(x) = \log x$then $f(x) - f(y) =$ _____.
8) If $f(x) = \log x$then $f(x) + f(y) =$ _____.
9) If $f(x) = \log(e^x)$then $f(0) =$ _____.
10) If $f(x) = \frac{a^x + a^{-x}}{2}$ is _____function. (Odd, even).

➢ **EXAMPLES**

1) If $f(x) = \log x$ then prove that $(i) f(xy) = f(x) + f(y)$

$$(ii) f\left(\frac{x}{y}\right) = f(x) - f(y)$$

$$(iii) f(x^2) = 2f(x).$$

2) If $f(x) = e^x$ then prove that $(i) f(x).f(y) = f(x+y)$

$$(ii) \frac{f(x)}{f(y)} = f(x-y).$$

3) If $f(x) = a^x$ then prove that $(i) f(x+y) = f(x).f(y)$

$$(ii) f(x-y) = \frac{f(x)}{f(y)}.$$

4) If $f(x) = a^x$ then prove that $f(x+1) - f(x) = (a-1)f(x)$.

5) If $f(x) = 4^x$ then prove that $f(x+1) - f(x) = 3f(x)$.

6) If $f(x) = \frac{1}{x+1}$ then prove that $f(x) + f\left(\frac{1}{x}\right) = 1$.

7) If $f(x) = \frac{ax+b}{bx+a}$ then prove that $f(x) \cdot f\left(\frac{1}{x}\right) = 1$.

8) If $f(x) = \frac{1-x}{1+x}$ then prove that $(i) f(x) + f\left(\frac{1}{x}\right) = 0$

$$(ii) f(x) - f\left(\frac{1}{x}\right) = 2f(x)$$

$$(iii) f(x) \cdot f(-x) = 1.$$

9) If $f(x) = \log\left(\frac{x}{x-1}\right)$ then prove that $f(a+1) + f(a) = \log\left(\frac{a+1}{a-1}\right)$.

10) If $f(x) = \log\left(\frac{x-1}{x}\right)$ then prove that $f(x) + f(-x) = f(x^2)$.

11) If $f(x) = \frac{1+x}{1-x}$ then prove that $f\left(\frac{x+y}{1+xy}\right) = f(x) \cdot f(y)$.

12) If $f(x) = \log_2 x$ and $g(x) = x^4$ then find $f(g(2))$.

13) If $f(x) = \frac{\sin x}{\sin x + \cos x}$ then prove that $f(x) + f\left(\frac{\pi}{2} - x\right) = 1$.

UNIT-II

MARKS-14

TRIGONOMETRY

TRIGONOMETRY

➢ MCQ'S

1) $\frac{4\pi}{9} radian = \_\_\_\_\_ Degree.$

2) $540° = \_\_\_\_\_ radian.$

3) $135° = \_\_\_\_\_ radian.$

4) $\cos(\pi + \theta) = \_\_\_\_\_.$

5) $\tan(\pi + \theta) = \_\_\_\_\_.$

6) $\cos\frac{\pi}{6} \cdot \cos\frac{\pi}{4} \cdot \cos\frac{\pi}{3} \cdot \cos\frac{\pi}{2} = \_\_\_\_\_.$

7) $\cos\frac{\pi}{2} \cdot \sin\frac{3\pi}{2} \cdot \sin\frac{5\pi}{2} = \_\_\_\_\_.$

8) $\sin\frac{\pi}{8} + \sin\frac{9\pi}{8} = \_\_\_\_\_.$

9) $\sin 120° = \_\_\_\_\_.$

10) $\sin 135° = \_\_\_\_\_.$

11) $sin^2 42° + sin^2 48° = \_\_\_\_\_.$

12) $sin^2 35° + sin^2 55° = \_\_\_\_\_.$

13) $sin^2 40° + sin^2 50° = \_\_\_\_\_.$

14) Period of $\cos(2x + 7)$is _____.

15) Principal Period of $\cos\left(\frac{2x}{3} + 5\right)$is _____.

16) Period of $\sin(2x + 3)$ is _____.

17) The Period of $\tan 3x$ is _____.

18) The Period of $3\cos 2x$ is _____.

19) Period of $\cot\frac{x}{6}$ is _____.

20) Period of $\sin 3x$ is _____.

21) $\sin(A + B) \cdot \sin(A - B) = \_\_\_\_\_.$

22) $\sin 3A = \_\_\_\_\_.$

23) $\cos 3A = \_\_\_\_\_.$

24) $\sin 40° + \sin 20° = \_\_\_\_\_.$

25) If $\tan\theta = \frac{3}{4}$then $\tan 2\theta = \_\_\_\_\_.$

26) $\sin^{-1} x + \cos^{-1} x = \_\_\_\_\_.$

27) $\tan^{-1} x + \cot^{-1} x = \_\_\_\_\_.$

28) $\tan^{-1}(\sqrt{3}) = \_\_\_\_\_.$

29) $\tan^{-1}\left(\frac{3}{4}\right) + \tan^{-1}\left(\frac{4}{3}\right) = \_\_\_\_\_.$

30) $\sin^{-1}\left(\cos\frac{\pi}{3}\right) = \_\_\_\_\_.$

31) Value of $\cos\left(2\tan^{-1}\left(\frac{1}{2}\right)\right) = \_\_\_\_\_.$

➢ **EXAMPLES**

1) Simplify $\frac{\sin\left(\frac{\pi}{2}+\theta\right)}{\cos(\pi-\theta)}+\frac{\cot\left(\frac{3\pi}{2}-\theta\right)}{\tan(\pi-\theta)}+\frac{\operatorname{cosec}\left(\frac{\pi}{2}-\theta\right)}{\sec(\pi+\theta)}$.

2) Prove that $\frac{\sin(\pi+\theta)}{\sin(2\pi-\theta)}+\frac{\tan\left(\frac{\pi}{2}+\theta\right)}{\cot(\pi-\theta)}+\frac{\cos(2\pi+\theta)}{\sin\left(\frac{\pi}{2}+\theta\right)}=3$.

3) Simplify $\frac{\sin(180°-\theta)\cdot\cos(270°-\theta)\cdot\operatorname{cosec}(90°+\theta)}{\sec(270°+\theta)\cdot\cos(90°+\theta)\cdot\tan(360°+\theta)}$.

4) Evaluate $\frac{\sin\left(\theta-\frac{\pi}{2}\right)}{\cos\left(\theta-\frac{\pi}{2}\right)}+\frac{\tan\left(\frac{\pi}{2}+\theta\right)}{\cot(\pi+\theta)}+\frac{\operatorname{cosec}\left(\frac{\pi}{2}+\theta\right)}{\sec(\pi+\theta)}$.

5) Find the value of $\frac{\sin\left(\theta-\frac{\pi}{2}\right)}{\cos(\theta-\pi)}+\frac{\sin\left(\frac{\pi}{2}-\theta\right)}{\cos(\pi-\theta)}+\frac{\operatorname{cosec}\left(\frac{\pi}{2}-\theta\right)}{\sec(\pi+\theta)}$.

6) Evaluate $\frac{\sin(-\theta)\cdot\tan\left(\frac{\pi}{2}+\theta\right)\cdot\sin(\pi+\theta)\cdot\sec\left(\frac{3\pi}{2}+\theta\right)}{\sin(2\pi-\theta)\cdot\cos\left(\frac{3\pi}{2}-\theta\right)\cdot\operatorname{cosec}(\pi-\theta)\cdot\cot(2\pi-\theta)}$.

7) Prove that $\cos\frac{19\pi}{6}\cdot\sin\frac{17\pi}{6}+\sin\frac{11\pi}{6}\cdot\cos\frac{13\pi}{6}=0$.

8) Prove that $sin^2\frac{\pi}{4}+sin^2\frac{3\pi}{4}+sin^2\frac{5\pi}{4}+sin^2\frac{7\pi}{4}=2$.

9) Prove that $\tan\frac{\pi}{20}\cdot\tan\frac{3\pi}{20}\cdot\tan\frac{5\pi}{20}\cdot\tan\frac{7\pi}{20}\cdot\tan\frac{9\pi}{20}=1$.

10) Prove that $\cot\frac{\pi}{20}\cdot\cot\frac{3\pi}{20}\cdot\cot\frac{5\pi}{20}\cdot\cot\frac{7\pi}{20}\cdot\cot\frac{9\pi}{20}=1$.

11) Draw the graph of $y=sinx, 0\le x\le\pi$.

12) Draw the graph of $y=sinx, -\frac{\pi}{2}\le x\le\frac{\pi}{2}$.

13) Draw the graph of $y=sin2x, 0\le x\le\pi$.

14) Draw the graph of $y=sin\frac{x}{2}, 0\le x\le 2\pi$.

15) Draw the graph of $y=cosx, 0\le x\le\pi$.

16) Draw the graph of $y=cosx, 0\le x\le 2\pi$.

17) Draw the graph of $y=cos\frac{x}{2}, 0\le x\le 2\pi$.

18) Prove that $\sin(A+B)\cdot\sin(A-B)=sin^2A-sin^2B$.

19) Prove that $\frac{\sin(A-B)}{\cos A\cdot\cos B}+\frac{\sin(B-C)}{\cos B\cdot\cos C}+\frac{\sin(C-A)}{\cos C\cdot\cos A}=0$.

20) Prove that $\tan 57°=\frac{\cos 12°+\sin 12°}{\cos 12°-\sin 12°}$

21) Prove that $\tan 55°=\frac{\cos 10°+\sin 10°}{\cos 10°-\sin 10°}$

22) Prove that $\tan 66°=\frac{\cos 21°+\sin 21°}{\cos 21°-\sin 21°}$

23) Prove that $(1+\tan 25°)(1+\tan 20°)=2$.

24) Prove that $\tan 20°+\tan 25°+\tan 20°\tan 25°=1$.

25) Prove that $\tan 50°=\tan 40°+2\tan 10°$.

26) For ΔABC prove that $\tan A+\tan B+\tan C=\tan A\cdot\tan B\cdot\tan C$.

27) Prove that $\tan 70°-\tan 50°-\tan 20°=\tan 70°\cdot\tan 50°\cdot\tan 20°$.

28) Prove that $\tan 5A-\tan 3A-\tan 2A=\tan 5A\cdot\tan 3A\cdot\tan 2A$.

29) Prove that (i) $\sin 3\theta=3\sin\theta-4sin^3\theta$ (ii) $\cos 3\theta=4cos^3\theta-3\cos\theta$.

30) If $\tan\theta=\frac{1}{2}$ then prove that $7\cos 2\theta+8\sin 2\theta=\frac{53}{5}$.

31) Prove that $\frac{1+\sin 2A-\cos 2A}{1+\sin 2A+\cos 2A}=\tan A$.

32) Prove that $\frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta}=\tan\frac{\theta}{2}$.

33) Prove that $\frac{\sin A+\sin 2A}{1+\cos A+\cos 2A}=\tan A$.

34) Prove that $\frac{\cos A+\cos 3A+\cos 5A}{\sin A+\sin 3A+\sin 5A}=\cot 3A$

35) Prove that $\frac{\cos 3A+2\cos 5A+\cos 7A}{\sin 3A+2\sin 5A+\sin 7A}=\cot 5A$

36) Prove that $\frac{\sin 4A+2\sin 5A+\sin 6A}{\cos 4A+2\cos 5A+\cos 6A}=\tan 5A$

37) Prove that $\frac{\sin\theta+\sin 2\theta+\sin 4\theta+\sin 5\theta}{\cos\theta+\cos 2\theta+\cos 4\theta+\cos 5\theta}=\tan 3\theta$

38) Prove that $\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2}$

39) Prove that $\tan^{-1}x+\cot^{-1}x=\frac{\pi}{2}$

40) Prove that $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{4}$

41) Prove that $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)=\tan^{-1}\left(\frac{1}{2}\right)$

42) Prove that $2\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\frac{\pi}{4}$

43) Prove that $2\tan^{-1}\left(\frac{2}{3}\right)=\tan^{-1}\left(\frac{12}{5}\right)$

44) Prove that $\tan^{-1}\left(\frac{1}{2}\right)-\tan^{-1}\left(\frac{1}{3}\right)=\tan^{-1}\left(\frac{1}{7}\right)$

45) Prove that $\sin^{-1}\left(\frac{3}{5}\right)+\tan^{-1}\left(\frac{4}{3}\right)=\frac{\pi}{2}$

46) Prove that $cos^{-1}\left(\frac{2}{\sqrt{5}}\right)+\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{4}$

UNIT-III

MARKS-14

VECTORS

VECTORS

➢ EXAMPLES

1) If $\bar{a} = j + k - i$ and $\bar{b} = 2i + j - 3k$ then find $|2\bar{a} + 3\bar{b}|$.

2) If $\bar{a} = (1,2,1), \bar{b} = (1,-1,2)$ and $\bar{c} = (3,2,-1)$ then find $|3\bar{a} + \bar{b} - 2\bar{c}|$.

3) If $\bar{a} = (3,-1,-4), \bar{b} = (-2,4,-3)$ and $\bar{c} = (-1,2,-5)$ then find magnitude of $\bar{a} + 2\bar{b} - \bar{c}$.

4) If $\bar{a} = 3i - 2j + k$, $\bar{b} = 2i - 4j - 3k$ and $\bar{c} = -i + 2j + 2k$ then find $|2\bar{a} - 3\bar{b} - 5\bar{c}|$.

5) If $\bar{a} = i + 2j - k$, $\bar{b} = 3i + j + 2k$ and $\bar{c} = -2i - j + 5k$ then find $|2\bar{a} + 3\bar{b} - \bar{c}|$..

6) If $\bar{a} = (3,-1,-4), \bar{b} = (-2,4,-3)$ and $\bar{c} = (-1,2,1)$ then find $|3\bar{a} - 2\bar{b} + 4\bar{c}|$.

7) If $\bar{a} = 3i - j - 4k$, $\bar{b} = -2i + 4j - 3k$ and $\bar{c} = i + 2j - k$ then find the direction cosines of the vector $3\bar{a} - 2\bar{b} + 4\bar{c}$.

8) If $\bar{a} = (-4,9,6), \bar{b} = (0,7,10)$ and $\bar{c} = (-1,6,6)$ then show that $(\bar{a} - \bar{c}) \cdot (\bar{b} - \bar{c}) = 0$.

9) If $\bar{x} = (1,-2,3)$and $\bar{y} = (-2,3,1)$ then find $(\bar{x} + \bar{y}) \cdot (\bar{x} - \bar{y})$.

10) If $\bar{x} = (1,-2,3)$and $\bar{y} = (1,2,-2)$ then find $(\bar{x} + \bar{y}) \cdot (\bar{x} - \bar{y})$.

11) If $\bar{a} = (1,-1,1), \bar{b} = (2,-1,1)$ and $\bar{c} = (1,1,-2)$ then find $\bar{a} \cdot (\bar{b} + \bar{c})$.

12) If $\bar{x} = (1,-2,-3)$ and $\bar{y} = (2,p,4)$ then for what value of p vectors $\bar{x}$ and $\bar{y}$ are perpendicular to each other.

13) For what value of m, the vectors $2i - 3j + 5k$ and $mi - 6j - 8k$ are perpendicular to each other?

14) For what value of p, the vectors $2i + 3j + k$ and $pi - j - 3k$ are perpendicular to each other?

15) If $(m, 2m, 4)$ and $(m,-3,2)$ are perpendicular to each other then find m.

16) Simplify $(10i + 2j + 3k) \cdot [(i - 2j + 2k) \times (3i - 2j - 2k)]$

17) If $\bar{a} = 2i - j$ and $\bar{b} = i + 3j - 2k$ then find $|(\bar{a} + \bar{b}) \times (\bar{a} - \bar{b})|$.

18) If $\bar{a} = (2,-3,-1)$ and $\bar{b} = (1,4,-3)$ then find $(\bar{a} + \bar{b}) \times (\bar{a} - \bar{b})$. Also find modulus of $(\bar{a} + \bar{b}) \times (\bar{a} - \bar{b})$.

19) If $\bar{x} = 3i - j + 2k$ and $\bar{y} = 2i + j - k$ then find the unit vector perpendicular to both $\bar{x}$ and $\bar{y}$.

20) Find a unit vector perpendicular to the both vectors $\bar{a} = (5,7,-2)$ and $\bar{b} = (3,1,-2)$.

21) Find a unit vector perpendicular to the both vectors $\bar{a} = (1,-1,1)$ and $\bar{b} = (2,3,-1)$.

22) If $\bar{a} = 2i - 3j + 4k$ and $\bar{b} = i - j + k$ then find the unit vector perpendicular to $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$.

23) If $\bar{x} = (1,1,1)$ and $\bar{y} = (2,-1,-1)$ then prove that $\bar{x}$ is perpendicular to $\bar{y}$. Also find the unit vector perpendicular to both $\bar{x}$ and $\bar{y}$.

24) Find the angle between $(1,2,4)$ and $(3,1,2)$.

25) Find the angle between $(1,2,3)$ and $(-2,3,1)$.

26) Find the angle between two vectors $2i + j - 3k$ and $2i - 2j + 4k$.

27) Show that angle between two vectors $i + j - k$ and $2i - 2j + k$ is $\sin^{-1}\sqrt{\frac{26}{27}}$.

28) Prove that angle between two vectors $i + 2j$ and $i + j + 3k$ is $\sin^{-1}\sqrt{\frac{46}{55}}$.

29) Prove that angle between two vectors $\bar{a} = i + 2j - 3k$ and $\bar{b} = 2i + j - k$ is $\sin^{-1}\sqrt{\frac{35}{84}}$.

30) Prove that angle between two vectors $3i + j + 2k$ and $2i - 2j + 4k$ is $\sin^{-1}\left(\frac{2}{\sqrt{7}}\right)$.

31) The forces $3i - 2j + k$ and$-i - j + 2k$ act on a particle and particle moves from the point $(2,2,-3)$ to the point $(-1,2,4)$ under the effect of these forces. Find the work done.

32) A particle moves from the point $(-1,2,1)$ to $(2,3,-1)$ under the effect of the forces $(1,2,1)$ and $(2,-1,0)$ find work done.

33) The constant forces $(1,2,3)$ and$(3,1,1)$ act on a particle and particle moves to the point $(5,1,2)$ from the point $(0,1,-2)$ under the effect of these forces. Find the total work done.

34) A particle moves from the point $(0,1,-2)$ to $(-1,3,2)$ under the action of the forces $(1,2,3)$, $(-1,2,3)$ and $(-1,2,-3)$ find the work done.

35) A particle moves from the point $3i - 2j + k$ to the point $i + 3j - 4k$ under the effect of constant forces $i - j + k, i + j - 3k$ and $4i + 5j - 6k$ find the work done.

36) The constant forces $2i + k + j, i + j + 2k$ and $2j - 3k$ acting on a particle and particle moves from the point $(5,3,2)$ to the point $(1,-1,2)$. Find the work done.

37) A force $\bar{F} = 2i + j + k$ is acting at a point $(-3,2,1)$. Find the magnitude of the moment of force about the point $(2,1,2)$.

UNIT-IV

MARKS-14

CO-ORDINATE GEOMETRY

CO-ORDINATE GEOMETRY

- **MCQ'S**

1) The distance between the points $(1,3)$ and $(0,-4)$ is_____.
2) The distance between the points $(1,1)$ and $(2,-1)$ is_____.
3) If $A(7,-5)$ and $B(3,-2)$ then $AB =$ _____.
4) The slope of the line $2x-5y+3=0$ is_____.
5) The slope of the line $2x+y-8=0$ is_____.
6) The slope of the line $3x-2y+8=0$ is_____.
7) The slope of the line $(\cos\alpha)x+(\sin\alpha)y=5$ is_____.
8) X-intercept of the line $2x+3y-4=0$ is_____.
9) Slope of the line passing through the points $(8,5)$ and $(1,-2)$ is_____.
10) Find the equation of the line passing through the point $(1,6)$ and $(-2,5)$.
11) The Slope of st-line perpendicular to st-line $5x-7y+3=0$ is _____.
12) The Slope of line perpendicular to $2x+3y=7$ is _____.
13) The angle between the st-lines $x+y=0$ and $x-y=0$ is _____.
14) The co-ordinate of midpoint of $\overline{AB}$, where $A(1,3)$ and $B(5,7)$ is _____.
15) If the midpoint of line segment AB is $(1,1)$ and $B(4,3)$ then the co-ordinate of $A =$ _____.
16) If P is the midpoint of a line segment $\overline{AB}$ for the points $A(-2,-1)$ and $B(4,3)$ then $P =$ ____.
17) The slope of the line passing through the point $(x,6)$ and $(-2,5)$ is$\frac{1}{3}$ then $x =$ _____.
18) The slope of line $x+ky+1=0$ is $\frac{-2}{3}$ then $k =$ _____.
19) The radius of the circle $x^2+y^2=18$ is_____.
20) The centre of the circle $x^2+y^2=25$ is_____.
21) Equation of circle having centre $(0,0)$ and radius 3 is_____.
22) The centre of a circle $(x-2)^2+(y+1)^2=9$ is_____.
23) Centre of a circle $x^2+y^2-2x+4y+1=0$ is_____.
24) Centre of a circle $x^2+y^2+3x-4y-4=0$ is_____.
25) The radius of a circle $x^2+y^2-4x-6y+4=0$ is _____.
26) Midpoint of a diameter of circle $x^2+y^2-2x+6y-15=0$ is_____.
27) If the radius of the circle $x^2+y^2-4x-8y+k=0$ is $\sqrt{19}$ then $k =$ _____.

➢ **EXAMPLES**

1) Prove that the points $(1,4), (3,-2)$ and $(-3,16)$ are co-linear.

2) Show that the points $(a, b+c), (b, c+a)$ and $(c, a+b)$ are co-linear.

3) If three points $(-k, 1), (k, 3)$ and $(6,5)$ are co-linear then find value of k.

4) Find the equation of straight line passing through the points $(-2,5)$ and $(1,6)$.

5) Find the equation of line passing through the points $(-1,2)$ and $(1,-2)$. also find the slope.

6) Find the equation of line passing through the points $(-2,-3)$ and having slope $\frac{3}{2}$.

7) Find the angle between two straight line $\sqrt{3}x - y + 1 = 0$ and $x - \sqrt{3}y + 2 = 0$.

8) The angle between two lines is $45°$. If the slope of first line is $\frac{2}{3}$ then find slope of other line.

9) Show that the line $3x - 2y + 5 = 0$ and $2x + 3y - 7 = 0$ are mutually perpendicular.

10) For what value of k the lines $7x + y = 1$ and $3x - ky = -2$ are perpendicular to each other?

11) If two lines $5x - py = 3$ and $2x + 3y = 4$ are (i) perpendicular to each other then find value of p. (ii) parallel then find value of p.

12) Find the equation of line which is parallel to the line $3x + 2y + 1 = 0$ and passing through the point $(1,-7)$.

13) Find the equation of line which is passing through $(2,4)$ and is perpendicular to $5x - 7y + 11 = 0$.

14) Find the equation of line perpendicular to the $3x + 4y = 0$ and passing through the point $(1,5)$.

15) Find the equation of line perpendicular to the $y - 4x + 1 = 0$ and passing through the point $(2,1)$.

16) Find the equation of line which is perpendicular bisector of line joining points $(8,-2)$ and $(6,4)$.

17) Find the equation of line which is perpendicular bisector of line joining points $(-1,2)$ and $(1,-2)$.

18) Find the equation of line which is perpendicular bisector of line joining points $(4,5)$ and $(-2,0)$.

19) Find the equation of a circle passing through $(3,4)$ and centre at $(4,3)$.

20) Find the equation of the circle passing through the points $(4,0), (0,4)$ and $(0,0)$.

21) Find centre and radius of the circle $x^2 + y^2 - 2x + 4y - 1 = 0$.

22) Find centre and radius of the circle $4x^2 + 4y^2 + 8x - 12y - 3 = 0$.

23) Find m if the radius of the circle $x^2 + y^2 - 4x - 8y + m = 0$ is 4 unit.

24) If the radius of the circle $2x^2 + 2y^2 - 4x - 8y + k = 0$ is 4 unit then find k.

25) Find the equation of tangent and normal to the circle $x^2 + y^2 - 2x + 4y - 20 = 0$ at the point $(-2,2)$.

26) Find the equation of tangent and normal to the circle $x^2 + y^2 - 6x + 10y + 21 = 0$ at the point $(1,-2)$.

27) Find the equation of tangent and normal to the circle $x^2 + y^2 - 2y - 7 = 0$ at the point $(2,3)$.

UNIT-V

MARKS-12

LIMIT

LIMIT

- **MCQ'S**

1) $\lim_{x\to 1}\frac{x^2-4x+3}{x+1} =$ _____.

2) $\lim_{x\to 0}\frac{x^2+3x+2}{5x+2} =$ _____.

3) $\lim_{x\to -2}\frac{x^3+2x^2-x-1}{x-2} =$ _____.

4) $\lim_{x\to 2}\frac{x^3-8}{x-2} =$ _____.

5) $\lim_{x\to 2}\frac{x^4-16}{x-2} =$ _____.

6) $\lim_{x\to 0}\frac{3^x-1}{x} =$ _____.

7) $\lim_{x\to 0}\frac{5^x-1}{x} =$ _____.

8) $\lim_{x\to 0}\frac{e^x-1}{x} =$ _____.

9) $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n =$ _____.

10) $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x =$ _____.

11) $\lim_{x\to 0}\frac{\sin x}{x} =$ _____.

12) $\lim_{\theta\to 0}\frac{\tan\theta}{\theta} =$ _____.

13) $\lim_{x\to 0}\frac{\sin 3x}{x} =$ _____.

14) $\lim_{\theta\to 0}\frac{\sin 5\theta}{\theta} =$ _____.

15) $\lim_{x\to 0}\frac{\sin 2x}{x} =$ _____.

16) $\lim_{\theta\to 0}\frac{\sin n\theta}{\theta} =$ _____.

17) $\lim_{x\to 0}\frac{x}{\sin x} =$ _____.

18) $\lim_{x\to 0}\frac{\sin 3x}{2x} =$ _____.

19) $\lim_{\theta\to 0}\frac{\theta}{\tan 3\theta} =$ _____.

20) $\lim_{x\to 0}\left(\frac{\tan 5x}{\sin 3x}\right) =$ _____.

- **EXAMPLES**

1) Evaluate $\lim_{x\to 1}\frac{x^2-4x+3}{x^2+2x-3}$

2) Evaluate $\lim_{x\to 1}\frac{x^3-3x+2}{7x^2-6x-1}$

3) Evaluate $\lim_{x\to 1}\frac{x^3-x^2+x-1}{x^2-1}$

4) Evaluate $\lim_{x\to 2}\frac{x^3-x^2-5x+6}{x^2-5x+6}$

5) Evaluate $\lim_{x\to -2}\frac{x^3+2x^2+x+2}{x^2+x-2}$

6) Evaluate $\lim_{x\to 2}\frac{x^3-2x^2+x-2}{x^2-x-2}$

7) Evaluate $\lim_{x\to -3}\frac{x^3+27}{x^2+5x+6}$

8) Evaluate $\lim_{x\to -1}\frac{2x^3+5x^2+4x+1}{3x^3+5x^2+x-1}$

9) Evaluate $\lim_{x\to 2}\frac{x^4-8x^2+16}{x^3-3x^2+4}$

10) Evaluate $\lim_{x\to 0}\frac{\sqrt{9+x}-3}{x}$

11) Evaluate $\lim_{x\to 0}\frac{\sqrt{25+x}-5}{x}$

12) Evaluate $\lim_{x\to a}\frac{\sqrt{2a-x}-\sqrt{x}}{a-x}$

13) Evaluate $\lim_{x\to \infty}\frac{5x^4+3x^2-2x+1}{2x^4+3x-1}$

14) Evaluate $\lim_{n\to \infty}\frac{4n^3-7n^2+5n-1}{8n^3+7n^2-4n+1}$

15) Evaluate $\lim_{x\to \infty}\frac{x(x+1)}{x^2+5x+6}$

16) Evaluate $\lim_{n\to \infty}\sqrt{n^2+n+1}-n$

17) Evaluate $\lim_{x\to \infty}\sqrt{x^2+x}-x$

18) Evaluate $\lim_{n\to \infty}\frac{1^2+2^2+3^2+\cdots+n^2}{n^3}$

19) Evaluate $\lim_{x\to 2}\frac{x^4-16}{x-2}$

20) Evaluate $\lim_{x\to 3}\frac{x^3-27}{\sqrt[3]{x}-\sqrt[3]{3}}$

21) Evaluate $\lim_{x\to 2}\frac{x\sqrt{x}-2\sqrt{2}}{x-2}$

22) Evaluate $\lim_{x\to 0}\frac{4^x-3^x}{x}$

23) Evaluate $\lim_{x\to 0}\frac{3^{x+3}-27}{x}$

24) Evaluate $\lim_{x\to 0} \frac{15^x - 5^x - 3^x + 1}{x^2}$

25) Evaluate $\lim_{x\to \infty} \left(1 + \frac{1}{x}\right)^{4x}$

26) Evaluate $\lim_{x\to 0} \left(1 + \frac{2x}{3}\right)^{\frac{5}{x}}$

27) Evaluate $\lim_{x\to 0} \left(1 + \frac{3x}{4}\right)^{\frac{5}{x}}$

28) Evaluate $\lim_{x\to \infty} \left(\frac{x+1}{x+2}\right)^{x}$

29) Evaluate $\lim_{x\to 0} \frac{3\sin x - \sin 3x}{x^3}$

30) Evaluate $\lim_{x\to 0} \frac{1-\cos x}{x^2}$

31) Evaluate $\lim_{x\to 0} \frac{\sin x(1-\cos x)}{x^3}$

32) Evaluate $\lim_{x\to 0} \frac{\operatorname{cosec} x - \cot x}{x}$

33) Evaluate $\lim_{x\to 0} \frac{a^x - \sin x - 1}{x}$

34) Evaluate $\lim_{x\to 0} \frac{e^x + \sin x - 1}{x}$

35) Evaluate $\lim_{x\to 0} \frac{e^x + \sin 2x - 1}{x}$