Q 1 Find the equation of locus of a point, which moves such that the ratio of its distances from ( 2,0) and (1, 3) is 5 : 4. (Ans : $9x^2 + 9y^2 + 14x - 150y + 186 = 0$)

Q 2 Find the equation of locus of a point P such that the difference of the squares of its distances from the points (5, 0) and (2. 3) is 10. (Ans : $3x - 3y - 1 = 0$ or $3x + 3y - 11 = 0$)

Q 3 If A = (3, 1) and B= (4, -5) are given points. Find the equation of locus of points P, such that $AP^2 + BP^2 = 50$. (Ans : $2x^2 + 2y^2 - 14x + 8y + 1 = 0$)

Q 4 If A=(2, 3), B=(-2, 1), find the equation of the locus of the point P, such that $AP^2 = 3BP^2$. (Ans : $x^2 + y^2 + 8x + 1 = 0$)

Q 5 Find the locus of the point P in each of the cases : (i) abscissa of P exceeds twice its ordinate by 3. (ii) The sum of its co-ordinates equals 10. Ans : (i) $x = 2y + 3$ (ii) $x + y = 10$

Q 6 If the origin is shifted to the point (2, -3), the axes remaining parallel , find the new co-ordinate of the points: (i) (5, 2); (ii) (2, -7); (iii) ( -10, 3) Ans : (i) (3, 5); (ii) (0, -4); (iii) ( -12, 6)

Q 7 If the origin is shifted to the point (-2, 1), the axes remaining parallel , find the old co-ordinate of the points: (i) (2, 4); (ii) (3, -5); (iii) (0, 4) Ans : (i) (0, 5); (ii) (1, -4); (iii) ( -2, 5)

Q 8 A(1, 4) and B(6, -3) are two vertices of triangle ABC and C is a point on the locus $5x + 4y = 9$. Find the equation of locus of the centroid of trianle ABC. (Ans : $5x + 4y - 16 = 0$)

Q 9 Given A (-5, 2) and B is the point on the locus $x^2 + y^2 - 2x + 4y + 8 = 0$. If the points P divides segment AB externally in the ratio 2:1, find the equation of the locus of P. (Ans : $x^2 + y^2 - 4x + 12y + 97 = 0$)

Q 10 Find the values of 'a' and 'b', if the points (3, 2), (-1, -2) lie on the locus $ax + by = 5$. ($a = 5, b = -5$)

Q 11 Find the value of 'a' if the points (-6, 3) lies on locus $x = 4ay$. ($a = 3$)

Q 12 A(5, 0) and B(-5,0) are two given points.A vriable point P is such that PA - PB = 6. Find the equation of locus of the point P. (Ans : $16x^2 - 9y^2 = 144$)

Q 13 Express the following angles in degrees (1) $-\left(\frac{7\pi}{12}\right)^c$ (2) $\left(\frac{1}{3}\right)^c$ (3) $\left(\frac{5\pi}{7}\right)^c$ (4) $-\left(\frac{2\pi}{9}\right)^c$

Ans (1) - 105 ° (2) $(60/\pi)°$ (3) $(900/\pi)°$ (4) - 40°

Q 14 Express the following angles in radians (i) 120° (ii) 945° (iii) -108° (iv) -144°

ANS : (1) $\left(\frac{2\pi}{3}\right)^c$ (2) $-\left(\frac{21\pi}{4}\right)^c$ (3) $-\left(\frac{3\pi}{5}\right)^c$ (4) $-\left(\frac{4\pi}{5}\right)^c$

Q 15 In $\Delta$ LMN, $m\angle L = 3\pi/4$ & $m\angle N = 30°$. Find $m\angle M$ both in degrees and radians [ Ans : $15° = \frac{\pi}{12}^c$ ]

Q 16 If $x^c = 405°$ and $y° = -\frac{\pi}{12}^c$, find x and y. [ Ans $x = 9\pi/4$ , $y = -15$]

Q 17 The difference between two acute angles of a right angled triangle is $3\pi/10$. Find the angles in in degrees and radians. [ Ans : $72^o$ & $18^o$ i.e.$2\pi/5$ & $\pi/10$ ]

Q 18 One angle of a triangle has measure $2\pi/9$ and the measure of other two angles are in the ratio 4 : 3 , find their measures in degrees and radians. [ Ans : $802^o$ & $60^o$ i.e.$4\pi/9$ & $\pi/3$ ]

Q 19 The radius of a circle is 9 cms. Find the length of an arc of this circle which cuts off a chord of length equal to length of radius . [ $s = 3\pi$ cms. ]

Q 20 The area of the circle is $25\pi$ sq.cms .Find the length of its arc subtending an angle of $144^o$ at the centre. Also find the area of the corresponding sector. [l(arc) = $4\pi$ cms. A(sector) =$10\pi$ sq. cms.]

Q 21 OPQ is a sector of a circle with centre O and radius is 15 cms. If $m\angle POQ = 30^o$, find the area enclosed by arc PQ and chord PQ. [ Ans : $75(\pi - 3)/4$ ]

Q 22 The perimeter of a sector of a circle, of area $64\pi$ sq.cms. is 56 cms. Find the area of sector. [ Ans : 160 sq.cms. ]

Q 23 Two circles , each of radius 7 cms , intersect each other . The distance between their centres is $7\sqrt{2}$ cms. Find the area common to both the circles. [ Ans : $49(\pi - 2)/2$ ]

Q 24 $\Delta$PQR is an equilateral triangle with side 18 cms. A circle is drawn on segment QR as diameter. Find Find the length of the arc of this circle intecepted with in the triangle. [ Ans : $3\pi$ cms ]

Q 25 If the two arcs of the same lengths in two circles subtend angles 65° and 110° at the centres . Find the ratio of their radii. [ Ans : 22 : 13 ]

Q 26 If the angles of a triangle are in AP and the greatest angle is 84°, ind all the three angles in radians. [ Ans : $\pi/5, \pi/13, 7\pi/15$ ]

Q 27 Evaluate : $\sin\pi + 2\cos\pi + 3\sin\left(\frac{3\pi}{2}\right) + 4\cos\left(\frac{3\pi}{2}\right) - 5\sec\pi - 6\,\text{cosec}\left(\frac{3\pi}{2}\right)$ [ Ans : 6 ]

Q 28 Evaluate : $\sin 0 + 2\cos 0 + 3\sin\left(\frac{\pi}{2}\right) + 4\cos\left(\frac{\pi}{2}\right) + 5\sec 0 + 6\,\text{cosec}\left(\frac{\pi}{2}\right)$ [ Ans : 16 ]

Q 29 Find the value of $\sin^2 30^o + \cos^2 60^o + \tan^2 45^o + \sec^2 60^o - \text{cosec}^2 30^o$ [ Ans : $\frac{3}{2}$ ]

Q 30 Find the value of $4\cot^2 30^o + 9\sin^2 60^o - 6\text{cosec}^2 60^o - \frac{9}{4}\tan^2 60^o$ [ Ans : 4 ]

Q 31 Verify that : $\dfrac{\tan^2(\pi/6) + \sin^2(\pi/6) + \cos^2(\pi/3)}{\sec^2(\pi/4 - \cos^2(\pi)} = \dfrac{1}{\sqrt{3}}\sec\left(\frac{\pi}{6}\right) + \dfrac{1}{3}\cos\left(\frac{\pi}{3}\right)$

Q 32 If $2\cos^2\theta + 3\cos\theta = 2$, then find $\cos\theta$. [ Ans : $\cos\theta = -2$ (Invalid), $\cos\theta = 1/2$ ]

Q 33 If $3\tan^2\theta - 4\sqrt{3}\tan\theta + 3 = 0$, then find $\tan\theta$ [ Ans : $\tan\theta = \sqrt{3}$ or $\tan\theta = 1/\sqrt{3}$ ]

Q 34 Find the values of the trigonometric functions if $\cos\theta = 4/5$ and $3\pi/2 < \theta < 2\pi$ [ ANS : $\sin\theta = -3/5$, $\tan\theta = -3/4$, $\sec\theta = 5/4$, $\text{cosec}\,\theta = -5/3$, $\cot = -4/3$ ]

Q 35 If $\cos\theta = -3/5$, $\pi < \theta < 3\pi/2$, find the value of $\dfrac{\text{cosec}\,\theta + \cot\theta}{\sec\theta - \tan\theta}$ [Ans : $\frac{1}{6}$ ]

Q 36 If $\dfrac{\sin A}{3} = \dfrac{\sin B}{4} = \dfrac{1}{5}$ where $\angle A$ and $\angle B$ are in the II$^{nd}$ quadrant, find the value of $4\cos A + 3\cos B$ [ Ans : - 5 ]

Q 37 Prove that $\sqrt{\dfrac{\sec x + 1}{\sec x - 1}} = \dfrac{1}{\text{cosec}\,x - \cot x}$

Q 38 Prove that : $\sec^4 x - \sec^2 x = \tan^4 x + \tan^2 x$

Q 39 Prove that $(1 - \tan x)^2 + (1 - \cot x)^2 = (\sec x - \text{cosec}\,x)^2$

Q 40 Prove that $(\text{cosec}\,x - \sin x)(\sec x - \cos x)(\tan x + \cot x) = 1$.

Q 41 Prove that $\sin^3 x + \cos^3 x = (\sin x + \cos x)(1 - \sin x \cos x)$

Q 42 Prove that $\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\operatorname{cosec}\theta + \cot\theta}$

Q 43 Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\operatorname{cosec}\theta$

Q 44 Prove that $\frac{\tan\theta}{\sec\theta + 1} + \frac{\sec\theta + 1}{\tan\theta} = 2\operatorname{cosec}\theta$

Q 45 Prove that : $\frac{\tan A}{\sec A - 1} = \frac{\tan A + \sec A + 1}{\sec A - 1 + \tan A}$

Q 46 Prove that : $\frac{1 + \operatorname{cosec} A + \cot A}{1 + \operatorname{cosec} A - \cot A} = \frac{\operatorname{cosec} A + \cot A - 1}{\cot A - \operatorname{cosec} A + 1}$

Q 47 If $x = r\cos\theta\cos\phi$, $y = r\cos\theta\sin\phi$ and $z = r\sin\theta$ then prove that $x^2 + y^2 + z^2 = r^2$.

Q 48 If $\tan x + \cot x = 3$ then show that $\tan^4 x + \cot^4 x = 47$

Q 49 Prove that $\frac{1 + 2\cos^2 A}{1 + 3\cot^2 A} = \sin^2 A$

Q 50 Prove that : $\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \frac{1 + \cos A}{\sin A}$

Q 51 If $2\cos^2 x + 7\sin x = 5$, find the permissible values of sin x.

Q 52 Without using trigonometric tables, find (i) cos 75°. (ii) tan 75°. Ans : (i) $\frac{\sqrt{3} - 1}{2\sqrt{2}}$ (ii) $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

Q 53 If $\sin\alpha = \frac{15}{17}$, $\pi/2 < \alpha < \pi$ and $\cos\beta = -\frac{4}{5}$, $\pi < \beta < 3\pi/2$, find (i) $\sin(\alpha - \beta)$. (ii) $\cos(\alpha - \beta)$.

[ Ans : (i) $\sin(\alpha - \beta) = -84/85$ (ii) $\cos(\alpha - \beta) = -13/85$ ]

Q 54 Prove that $\sqrt{2}.\cos\left(\frac{\pi}{4} - A\right) = \cos A + \sin A$

Q 55 Prove that $\sin(25° + \theta).\cos(25° - \phi) - \cos(25° + \theta).\sin(25° - \phi) = \sin(\theta + \phi)$.

Q 56 Prove that : $\sin\left(\frac{\pi}{6} + A\right)\cos\left(\frac{\pi}{3} - B\right) + \sin\left(\frac{\pi}{3} - B\right).\cos\left(\frac{\pi}{6} + A\right) = \sin(x + y)$

Q 57 Prove that : $\sin A.\sin(B - C) + \sin B.\sin(C - A) + \sin C.\sin(A - B) = 0$

Q 58 Prove that : $\frac{\tan 5A - \tan 3A}{\tan 5A + \tan 3A} = \frac{\sin 2A}{\sin 8A}$

Q 59 Prove that : $\tan 18^\circ + \tan 27^\circ + \tan 18^\circ.\tan 27^\circ = 1$

Q 60 Prove that : $\frac{\cos 27^\circ + \sin 27^\circ}{\cos 27^\circ - \sin 27^\circ} = \tan 72^\circ$

Q 61 Prove that : $\frac{\cos 15^\circ - \sin 15^\circ}{\cos 15^\circ + \sin 15^\circ} = \frac{1}{\sqrt{3}}$

Q 62 If $\tan = \frac{5}{6}$, $\tan B = \frac{1}{11}$, prove that : $A + B = \frac{\pi}{4}$

Q 63 Find the values of the following (1) $\tan 840^\circ$ (2) $\tan(-690^\circ)$ (3) $\operatorname{cosec}(-930)^\circ$ (4) sec 510

[ANS : (i) $\tan(840°) = -\sqrt{3}$ (ii) $\tan(-690°) = -1/\sqrt{3}$ (iii) $\operatorname{cosec}(-930°) = 2$ (iv) $\sec(510°) = -2/\sqrt{3}$]

Q 64 Show that : $\sin(-330).\cos(-330) + \sin(-420).\cos(390) = -\frac{1}{2}$

Q 65 Show that : $\cot(405^\circ).\tan(-495^\circ) - \tan(585^\circ).\cot(-495^\circ) = 0$

Q 66 Show that : $\dfrac{\sin(90^\circ + A)}{\cos(-A)} - \dfrac{\sin(180^\circ - A)}{\sin(-A)} + \dfrac{\tan(270^\circ + A)}{\cot(-A)} = 3$

Q 67 Show that : $\dfrac{\operatorname{cosec}(90^\circ - A).\sin(180^\circ - A).\cot(360^\circ - A)}{\sec(180^\circ + A).\tan(90^\circ + A).\sin(-A)} = 1$

Q 68 Prove that : $\sin^2\left(\dfrac{\pi}{4} - x\right) + \sin^2\left(\dfrac{\pi}{4} + x\right) = 1$

Q 69 Prove that : $\cos\left(\dfrac{\pi}{12}\right) + \cos\left(\dfrac{3\pi}{12}\right) + \cos\left(\dfrac{9\pi}{12}\right) + \cos\left(\dfrac{11\pi}{12}\right) = 0$

Q 70 Prove that : $\sin^2\left(\dfrac{\pi}{8}\right) + \sin^2\left(\dfrac{3\pi}{8}\right) + \sin^2\left(\dfrac{5\pi}{8}\right) + \sin^2\left(\dfrac{7\pi}{8}\right) = 0$

Q 71 If $\tan\theta = -\dfrac{4}{5}$, $\pi < \theta < \dfrac{3\pi}{2}$, then find (i) $\sin 2\theta$ (ii) $\cos 2\theta$ (iii) $\tan 2\theta$.

[ Ans : (i) $\sin 2\theta = 24/25$ (ii) $\cos 2\theta = -7/25$ (iii) $\tan 2\theta = -24/25$ ]

Q 72 Prove that : $\sin 2A(\tan A + \cot A) = 2$

Q 73 Prove that : $\dfrac{\sin 2A}{\sin A} - \dfrac{\cos 2A}{\cos A} = \sec A$

Q 74 Prove that : $\dfrac{\sin 3A}{\cos A} + \dfrac{\cos 3A}{\sin A} = 2\cot 2A$

Q 75 Prove that : $\cos 20^\circ.\cos 40^\circ.\cos 60^\circ.\cos 80^\circ = \dfrac{1}{16}$

Q 76 Prove that : $\dfrac{1 + \cos\theta}{\sin\theta} = \cot\left(\dfrac{\theta}{2}\right)$

Q 77 Prove that : $\tan\left(\dfrac{\pi}{4} + \dfrac{\theta}{2}\right) = \dfrac{1}{\sec\theta - \tan\theta}$

Q 78 Prove that : $\dfrac{3.\cos A + \cos 3A}{3.\sin A - \sin 3A} = \cot^3 A.$

Q 79 Expand the determinants : (a) $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$ (b) $\begin{vmatrix} 1 & 2 & 3 \\ 12 & 13 & 14 \\ 33 & 34 & 35 \end{vmatrix}$ [ Ans : (a) - 12 (b) 0 ]

Q 80 Find x, if : (a) $\begin{vmatrix} x & 2 & 1 \\ 3 & x & -2 \\ 1 & 3 & 1 \end{vmatrix} = 5$ (b) $\begin{vmatrix} 0 & -3 & x \\ x+1 & 3 & 1 \\ 4 & 1 & 5 \end{vmatrix} = 0$ [ Ans : (a) $x = -6$ or $1$ (b) $x = -1$ or $-3$ ]

Q 81 Show that $\begin{vmatrix} i & -2i & -1 \\ 3i & i^3 & -2 \\ 1 & -3 & -i \end{vmatrix} = 11i$, where $i = \sqrt{-1}$.

Q 82 Without expanding the determinant show that the value of the following determinents is zero.

(i) $\begin{vmatrix} 1 & xy & xy(x+y) \\ 1 & yz & yz(y+z) \\ 1 & zx & zx(z+x) \end{vmatrix}$ (ii) $\begin{vmatrix} x+a & x+b & x+c \\ y+a & y+b & y+c \\ z+a & z+b & z+c \end{vmatrix}$

[ Hint : (i) $C_3 \to C_3 + (xyz)C_1$ . Take $(x + y + z)$ Common.
(ii) $R_1 \to R_1 - R_2$, $R_2 \to R_2 - R_3$.. Take $(x - y)$ and $(y - z)$ Common from $R_1$ & $R_2$ ]

Q 83 Without expanding the determinants, show that

(i) $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = \begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix}$ (ii) $\begin{vmatrix} x+y & y+z & z+x \\ z+x & x+y & y+z \\ y+z & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} x & y & z \\ x & y & z \\ x & y & z \end{vmatrix}$

[ Hint : (i) Take a, b, c from $R_1$, $R_2$, $R_3$. Then multiply $C_1$ by abc.
(ii) $R_1 \to R_1 + R_2 + R_3$ Take 2 common from $R_1$, $R_1 \to R_1 - R_3$, $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_2$ ]

Q 84 Without expanding the determinants, show that

(i) $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = (a-b)(b-c)(c-a)$ (ii) $\begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$

[Hint : (i) $R_1 \to R_1 - R_2$, $R_2 \to R_2 - R_3$ .Take (a - b)(b - c) from $R_1$ & $R_2$. $R_1 \to R_1 - R_2$. Expand
(ii) $C_1 \to C_1 - C_2$, $C_2 \to C_2 - C_3$ . Take ( x - y ) ( y - z ) from $C_1$ & $C_2$.
Simplify , Factorize then $C_1 \to C_1 - C_2$ Take ( z - x ) from $C_1$ then Expand ]

Q 85 Solve the following equations

(i) $\begin{vmatrix} x-1 & x+1 & x+1 \\ x+1 & x-1 & x+1 \\ x+1 & x+1 & x-1 \end{vmatrix} = 0$ (ii) $\begin{vmatrix} x+1 & x+2 & 3 \\ 3 & x+2 & x+1 \\ x+1 & 2 & x+3 \end{vmatrix} = 0$ (iii) $\begin{vmatrix} x+1 & 4 & 3 \\ 2 & x+8 & 6 \\ 3 & 12 & x+9 \end{vmatrix} = 0$

[Hint : (i) $R_1 \to R_1 + R_2 + R_3$ Take (3x - 1) from $R_1$ . Expand : x = -1/3
(ii) $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$. Take (x - 2) & x from $R_2$ & $R_3$. Expand : x = 0, 2, - 3
(iii) $C_2 \to C_2 - 4C_1$ and $C_3 \to C_3 - 3C_1$ . Expand : x = 0, -18 ]

Q 86 Solve the equations , $3x + 4y - 7 = 0$ , $y - 2x = 3$ , using Cramer's Rule [Ans : x = - 5/11, y = 23/11]

Q 87 Find x and y using Cramer's Rule if $\frac{1}{x} - \frac{2}{y} = 6$ , $\frac{3}{x} + \frac{1}{y} = 8$ [Ans : x = 7/22, y = - 7/10]

Q 88 Solve the following equations using Cramer's Rule
(i) $2x - y + 3z = 9$, $x + y + z = 3$ , $x - y + z = 2$. [ Ans : x = 1, y = 2 , z = 3. ]
(ii) $x + 2y + 3z = 6$, $2x + 4y + z = 7$ , $3x + 2y + 9z = 14$. [ Ans : x = 1, y = 1 , z = 1. ]

Q 89 Find x , y and z using Cramer's Rule if [Ans : x = 3/25, y = - 3, z = -1/6]

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 2$, $\frac{1}{x} - \frac{2}{y} + \frac{1}{z} = 3$, and $\frac{2}{x} - \frac{1}{y} + \frac{3}{z} = -1$.

Q 90 The sum of three numbers is 6. Twice the third number when added to the first number gives 7. On adding the sum of second and third number to three times the first number, we get 12. Find the three numbers using determinants. [Ans : The numbers are 3, 1, and 2 ]

Q 91 Examine the consistency of the following equations.
(i) $5x + 6y = 17$ , $2x + 3y = 8$ , $x + y = 3$ . [ Ans : Consistent ]
(ii) $3x + 2y + 4$, $5x + 4y + 7 = 0$ , $4x + 3y + 6 = 0$ . [ Ans : Not Consistent ]

Q 92 Show that the equations , $2x + 3y + 4 = 0$ , $x + 2y + 3 = 0$ , $3x + 4y + 5 = 0$ are consistent

Q 93 Find k if the following equations are consistent.
(i) $7x - ky = 4$, $2x + 5y = 9$ and $2x + y = 8$.
(ii) $x + y - k = 0$, $kx - 4y + 5 = 0$ and $kx - 2y + 1 = 0$.
[ ANS : $k = \frac{185}{2}$ or $k = 3$ or $-1$ ]

Q 94 Find the area of the following triangles whose vertices are
(i) (4, 5) , (0, 7) , (-1, 1) (ii) (3, 6) , (-1, 3) , (2, -1) [Ans : (i) 13 sq.units (ii) 25/2 sq.units]

Q 95 Find k if the area of the triangle with the vertices at A(k, 3) , B(- 5, 7) and C(-1, 4) is 4 Sq.Units
[ Ans : k = 3 or k = - 7/3 ]

Q 96 Find k if the area of the triangle with the vertices at P(3, - 5), Q(- 2, k) and R(1, 4) is $\frac{33}{2}$ Sq.Units
[ Ans : k = 34 or k = 1 ]

Q 97 Without using tables, show that (i) $\frac{2}{5} < \log_{10} 3 < \frac{1}{2}$ (ii) $\frac{2}{3} < \log_{10} 5 < \frac{3}{4}$

Q 98 If $\frac{\log x}{b - c} = \frac{\log y}{c - a} = \frac{\log z}{a - b}$ , then show that (i) $xyz = 1$ (ii) $x^{b+c} \cdot y^{c+a} \cdot z^{a+b} = 1$

Q 99 Evaluate : (i) $i^{35}$ (ii) $i^{888}$ (iii) $i^{93}$ (iv) $i^{403}$ (v) $i^{-58}$ (vi) $i^{-888}$ (vii) $i^{30} + i^{40} + i^{50} + i^{60}$
Answers : (i) -i (ii) 1 (iii) i (iv) -i (v) -1 (vi) 1 (vii) 0

Q 100 Solve : (i) $x^2 - 4x + 13 = 0$ (ii) $x^2 + 3ix + 10 = 0$ (iii) $2x^2 + 3ix + 2 = 0$ (iv) $ix^2 - 4x - 4i = 0$
Answers : (i) $2 \pm 3i$ (ii) 2i or -5i (iii) i/2 or -2i (iv) -2i

Q 101 Simplify : (i) $\omega^{18}$ (ii) $\omega^{-30}$ (iii) $\omega^{-105}$ (iv) $(2 - \omega)(2 - \omega^2)$ (v) $(1 + \omega - \omega^2)^6$
(vi) $(1 + \omega)^3 - (1 + \omega^2)^3$ (vii) $(1 + \omega)(1 + \omega^2)(1 + \omega^4)(1 + \omega^8)$
Answers : (i) 1 (ii) 1 (iii) 1 (iv) 7 (v) 64 (vi) 0 (vii) 1

Q 102 If $f(x) = ax^2 + bx + 2$ and $f(1) = 3$ , $f(4) = 42$ , then find a and b. (Ans : a = 3 , b = -2)

Q 103 If $f(x) = f(3x - 1)$, where $f(x) = x^2 - 4x + 11$, then find the value of x. (Ans : a = 5/4 , b = 1/2)

Q 104 Find the domain and range : (i) $f(x) = x^2$. (ii) $f(x) = 3x - 4$, for $-1 \leqslant x \leqslant 3$
(iii) $f(x) = 9 - 2x^2$, for $-5 \leqslant x \leqslant 3$ (iv) $f(x) = x^2 - 6x + 11$
Answers : (i) R, $[0, \infty)$ (ii) [-1, 3] , [-7, 5] (iii) [-5, 3] , [-41, 9] (iv) R, $[2, \infty)$

Q 105 Find fog and gof : (i) $f(x) = \frac{1}{x}$ , $g(x) = \frac{x - 2}{x + 2}$ (ii) $f(x) = \frac{3x + 2}{4x - 1}$ , $g(x) = \frac{x + 2}{4x - 3}$

Ans : $fog = \frac{x + 2}{x - 2}$ , $gof = \frac{1 - 2x}{1 + 2x}$ Ans : $fog = \frac{x + 2}{x - 2}$ , $gof = \frac{1 - 2x}{1 + 2x}$

Q 106 If $f(x) = \frac{2x + 1}{5x - 2}$ , find f o f. (Ans : fof = x )

Q 107 If $f(x) = 3x - 4$ , then find $f^{-1}(9)$. (Ans : 13/3 )

Q 108 If $f(x) = 5x^3 - 8$ , then find $f^{-1}(32)$. (Ans : 2 )

Q 109 If $f(x) = \frac{3x}{5} + 2$ , then find $f^{-1}(14)$. (Ans : 20 )

Q 110 Find whether the function $f : R \to R$ given by $f(x) = x^3 + 5$ for all $x \in R$ is one-one,onto or not
(Ans : one-one, onto)

Q 111 If the seventh term of an AP is 30 and the tenth term is 21, find the fourth term. ( $t_4 = 39$ )

Q 112 If the third term of an AP is -11 and the nineth term is -35 find the $n^{th}$ term of the AP. ($T_n = 1 - 4n$)

Q 113 Find three no.s in AP such that their sum is 24 and the sum of their squares is 200. (6,8,10 or 10, 8,6)

Q 114 Find four numbers in AP such that the sum of the first and the last is 8 and the product of the second and the third is 12. ( Ans : -2, 2, 6, 10 or 10, 6, 2, -2 )

Q 115 Find the sum $1 + 4 + 7 + \cdots\cdots$ to 22 terms (Ans : 715)

Q 116 Find the value of n if $1 + 4 + 7 + \cdots\cdots$ to n terms = 590 (Ans : 20)

Q 117 Find the value of n if $50 + 46 + 42 + 38 + \cdots\cdots$ to n terms = 336 (Ans : n =12 or n = 14)

Q 118 For a GP if a = 7 and r = 1/3 , find $t_6$ . Ans $\frac{7}{243}$

Q 119 For a GP if a = 5 and r = 2 , find $t_5$ . Ans 80

Q 120 For a GP if a = 2/3 and $t_6$ = 162 , find r. (Ans r = 3)

Q 121 For a GP if $t_8$ = 640 and r = 2 , find a. (Ans : a = 5 )

Q 122 Find three numbers in GP such that their sum is 35 and their product is 1000. Ans : 5, 10, 20
20, 10, 5

Q 123 Find three numbers in GP such that their sum is $\frac{13}{3}$ and the sum of their squares is $\frac{91}{9}$.
( Ans : 3, 1, 1/3 or 1/3, 3, 1 )

Q 124 Find four numbers in GP such that their product is 1 and the sum of the second and the third is $\frac{10}{3}$
(Ans 1/27, 1/3, 3, 27 or 27, 3, 1/3, 1/27 )

Q 125 Find five numbers in GP such that their product is 32 and the product of the last two is 108.
(Ans : 2/9, 2/3, 2, 6, 18 )

Q 126 For a GP if a = 1 and r = -3/2 , find $S_5$ . $\left(\text{Ans : } \frac{55}{6}\right)$

Q 127 For a GP if $S_5$ = 1023 and r = 4 , find a. (Ans : a = 3 )

Q 128 For a GP if a = 2 and r = 3 and $S_n$ = 242 , find n. (Ans : n = 5 )

Q 129 For a GP if $t_3$ = 18 and $t_6$ = 486 , find $S_5$ . (Ans : $S_5$ = 242 )

Q 130 Find the sum 2 + 22 + 222 + ..... to n terms. Ans : $\frac{20(10^n - 1) - 18n}{81}$

Q 131 Find the sum 3 + 33 + 333 + ..... to n terms. Ans : $\frac{10(10^n - 1) - 9n}{27}$

Q 132 Find the sum 5 + 55 + 555 + ..... to n terms. Ans : $\frac{20(10^n - 1) - 18n}{81}$

Q 133 Find the sum $0.9 + 0.99 + 0.999 + \cdots$ to n terms. Ans : $\frac{1}{9}[\,9n - 1 + (0.1)^n\,]$

Q 134 Find the sum $0.5 + 0.55 + 0.555 + \cdots$ to n terms. Ans : $\frac{5}{81}[\,9n - 1 + (0.1)^n\,]$

Q 135 Evaluate : (i) $\sum_{r=1}^{n} (2r - 8)$ (ii) $\sum_{r=1}^{n} (2r - 1)(2r + 1)$ (iii) $\sum_{r=1}^{n} (6r^2 - 2r + 6)$

Ans : $n^2 - 7n$ Ans : $\frac{n}{3}[\,4n^2 + 6n - 1\,]$ Ans : $2n(n^2 + n + 3)$

Q 136 Find the sum $19 + 21 + 23 + \ldots\ldots + 81$ using sigma notation. ( Ans : 1600 )

Q 137 Find the sum $5 + 8 + 11 + \ldots\ldots$ to 25 terms using sigma notation. ( Ans : 1025 )

Q 138 Find the sum $4 + 7 + 10 + \ldots\ldots$ to n terms using sigma notation. Ans : $\frac{n}{2}(3n + 5)$

Q 139 Find the sum $1.3 + 3.5 + 5.7 + \ldots\ldots$ to n terms using sigma notation. Ans : $\frac{n}{3}[\,4n^2 + 6n - 1\,]$

Q 140 Find the sum $2^2 + 4^2 + 6^2 + \ldots\ldots$ to n terms using sigma notation. Ans : $\frac{2n(n+1)(2n+1)}{3}$

Q 141 Find the sum $31^2 + 32^2 + 33^2 + \ldots + 50^2$ using sigma notation. ( Ans : 33470)

Q 142 Evaluate : (i) $\lim\limits_{x\to 3} \dfrac{x^2 - x - 6}{x^3 - 3x^2 + x - 3}$ (ii) $\lim\limits_{x\to 3} \dfrac{x^2 - 3}{x^2 + 3\sqrt{3}x - 12}$ (iii) $\lim\limits_{x\to 1/4} \dfrac{4x - 1}{2\sqrt{x} - 1}$

Ans : 1/2 Ans : 2/5 Ans : 2

Q 143 Evaluate : (i) $\lim\limits_{x\to 4} \dfrac{x^3 - 64}{x^2 - 16}$ (ii) $\lim\limits_{x\to a} \dfrac{x^{5/7} - a^{5/7}}{x^{2/7} - a^{2/7}}$ (iii) $\lim\limits_{x\to 3} \dfrac{\sqrt[4]{x} - \sqrt[4]{3}}{\sqrt[3]{x} - \sqrt[3]{3}}$

Answers : (i) 6 (ii) $\frac{5}{2}\,a^{3/7}$ (iii) $\frac{3}{4}\,4^{-1/12}$

Q 144 If $\lim\limits_{x\to a} \dfrac{x^5 - a^5}{x - a} = 405$, find all possible values of a (Ans : $a = \pm 3$ )

Q 145 If $\lim\limits_{x\to a} \dfrac{x^9 - a^9}{x - a} = 9$, find all possible values of a (Ans : $a = \pm 1$ )

Q 146 Evaluate : (i) $\lim\limits_{x\to 2} \dfrac{\sqrt{x+2} - \sqrt{2}}{x}$ (ii) $\lim\limits_{x\to 3} \dfrac{\sqrt{x^2+1} - \sqrt{10}}{x - 3}$ (iii) $\lim\limits_{x\to 0} \dfrac{\sqrt{1 + x + x^2} - 1}{x}$

Ans $\dfrac{1}{2\sqrt{2}}$ Ans $\dfrac{3}{\sqrt{10}}$ Ans $\dfrac{1}{2}$

Q 147 Evaluate : (i) $\lim\limits_{x\to 0} \dfrac{1 - \cos x}{x^2}$ (ii) $\lim\limits_{x\to 0} \dfrac{2\sin x - \sin 2x}{x^3}$ (iii) $\lim\limits_{x\to \frac{\pi}{4}} \dfrac{1 - \tan x}{1 - \sqrt{2}\sin x}$

Ans $\frac{1}{2}$ Ans 1 Ans 2

Q 148 Evaluate : (i) $\lim\limits_{x\to a} \dfrac{\sin x - \sin a}{x - a}$ (ii) $\lim\limits_{x\to \frac{\pi}{3}} \dfrac{\sqrt{3} - \tan x}{\pi - 3x}$ (iii) $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\operatorname{cosec} x - 1}{\left(\frac{\pi}{2} - x\right)^2}$

Ans cos a Ans $\frac{4}{3}$ Ans $\frac{1}{2}$

Q 149 Evaluate : (i) $\lim\limits_{x\to 0} \dfrac{3^x - 5^x}{x}$ (ii) $\lim\limits_{x\to 0} \dfrac{15^x - 5^x - 3^x + 1}{x^2}$ (iii) $\lim\limits_{x\to 1} \dfrac{a\,b^x - a^x\,b}{x^2 - 1}$

Ans : $\log\left(\frac{5}{3}\right)$ Ans : $(\log 5)(\log 3)$ Ans : $\frac{ab}{2}\log\left(\frac{b}{a}\right)$

Q 150 Evaluate : (i) $\lim\limits_{x\to 0} \left(1 - \dfrac{3x}{5}\right)^{\frac{1}{x}}$ (ii) $\lim\limits_{x\to 0} \left(\dfrac{1 - x}{1 + x}\right)^{\frac{1}{x}}$ (iii) $\lim\limits_{x\to 0} \dfrac{\log(3 - x) - \log(3 + x)}{x}$

Ans : $\dfrac{1}{e^{3/5}}$ Ans : $\dfrac{1}{e^2}$ Ans : $-\dfrac{2}{3}$

-- End --