1ST YEAR MATHS-1B MOST IMPORTANT QUESTIONS

GUNSHOT QUESTIONS -2026

LOCUS (Q: 18.)

1. If p and q are the lengths of the perpendiculars from the origin to the straight lines $x \sec \alpha - y \sin \alpha = a \cos 2\alpha$ then prove that $4p^2 + q^2 = a^2$.
2. Find the orthocenter of the triangle with the vertices (i) (-2,3), (2,-1) and (-4,0) (ii) (-2,-1), (6,-1) and (2,5)
3. If Q (h,k) is the foot of the perpendicular $P(x_1,y_1)$ w.r.t the straight line $ax + by + c = 0$. Then $(h - x_1):a = (k - y_1);b= - (ax_1 + by_1 + c):a^2 + b^2$ (or) $\frac{h-x_1}{a} = \frac{k-y_1}{b} = \frac{-(ax_1+by_1+c)}{a^2+b^2}$ And also find the foot of perpendicular from the point (4,1) on the line $3x - 4y + 12 = 0$

3 (b). Find the circumcenter of the triangle whose sides are (i) (1,3), (-3,5) and (5,1)

PAIR OF STRAIGHT LINES (Q: 19.)

2. Find the values of k, if the lines joining the origin to the points of intersection of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are mutually perpendicular.

1(a) Find the angle between the lines joining the origin to the points of intersection of the curve $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line $3x - y + 1 = 0$

2(b) Find the condition for the chord $lx + my = 1$ of the circle $x^2 + y^2 = a^2$ to subtend a right angled at the origin.

3. Show that the lines joining the origin to the points of intersection of the curve $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ and the straight line $x - y - \sqrt{2} = 0$ are mutually perpendicular.

PAIR OF STRAIGHT LINES (Q: 20.)

1 . Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and

$lx + my + n = 0$ is $\frac{n^2\sqrt{h^2-ab}}{|am^2-2hlm+bl^2|}$ sq.units.

2. Show that the product of the perpendicular distance origin to the pair of

straight lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\frac{|C|}{\sqrt{(a-b)^2+4h^2}}$

3 If the second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = o$ in two variables x and y represent a pair of straight lines, then

i) $h^2 = ab$ (ii) $af^2 = bg^2$ iii) the distance between parallel lines = $2\sqrt{\frac{g^2-ac}{a(a+b)}} = 2\sqrt{\frac{f^2-bc}{b(a+b)}}$

Extra

4. Let the equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of straight lines. Then the

angle θ between the line is given by $\cos\theta = \frac{a+b}{\sqrt{(a-b^2)+4^{\ \ 2}}}$

DIRECTION COSINES AND DIRECTION RATIOS (Q: 21.)

1(a) If a ray makes the angles α,β,γ and δ with four diagonals of cube then find

$\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta$

1(b) Find the angle between two diagonals of a cube.

2(a) Find the angle between the lines whose direction cosines satisfy the equations

$l + m + n = 0$, $l^2 + m^2 - n^2 = 0$.

2(b) Show that direction cosines of two lines which are connected by the relations

$l + m + n = 0$ and $2mn + 3nl - 5lm = 0$ are perpendicular to each other.

3. Find the angle between the lines whose direction cosines are given by the equations

$3l + m + 5n = 0$ and $6mn - 2nl + 5lm = 0$.

DIFFERENTIATIONS (Q: 22.)

1(a) If $\sqrt{1-x^2} + \sqrt{1-y^2}$ = a (x – y) then show that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

1(b) If y = $Tan^{-1}\left[\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ for 0 <|x|<1 find $\frac{dy}{dx}$

2(a) If $x^y + y^x = a^b$ then show that $\frac{dy}{dx} = -\left(\frac{yx^{y-1}+y^x logy}{x^y logx+xy^{x-1}}\right)$

2(b) If y = $(sinx)^x + x^{sinx}$ find $\frac{dy}{dx}$ 2(c) If y = $(sinx)^{logx} + x^{sinx}$ find $\frac{dy}{d}$

3 . If $Tan^{-1}\left(\frac{2x}{1-x^2}\right) + Tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right) - Tan^{-1}\left(\frac{4x-4x^3}{1-6x^2+x^4}\right)$ S.T $\frac{dy}{dx} = \frac{1}{1+x^2}$

TANGENTS AND NORMALS (Q: 23.)

1. Show that curves $y^2 = 4(x+1)$ and $y^2 = 36(9-x)$ intersect orthogonally.
2. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.
3. At any point 't' on the curve x = a(t + sin t), y = a(1 – cos t),find the length of tangent and normal.

MAXIMA AND MINIMA (Q: 24.)

1. A wire of length 'l' is cut into two parts which are bent respectively in the form of a square and a circle. What are the lengths of the pieces of the wire respectively so that the sum of the areas is the least.
2. From a rectangular sheet of dimensions 30cm x 80cm four equal squares of side x cm are removed at the corners, and the sides are then turned up so as to form an open rectangular box. Find the value of x, so that the volume of the box is the greatest.
3. (a) If the curved surface of right circular cylinder inscribed in a sphere of radius 'r' is maximum, show that the height of the cylinder is $\sqrt{2}r$.

   (b) Find two positive integers whose sum is 15 and the sum of whose squares is minimum

1st YEAR MATHS-1B MOST IMPORTANT SAQ QUESTIONS

SHORT ANSWERS QUESTION (SAQ'S)

LOCUS (Q:11)

1) If the distance from P to the points (2,3) and (2,-3) are in the ratio 2 : 3, then find the equation of locus of P.
2) A (5,3) and B(3,-2) are two fixed points. Find the equation of locus of P, so that the area of triangle PAB is 9.
3.(a) The ends of the hypotenuse of a right angled triangle are (0,6) and (6,0). Find the equation of locus of its third vertex.
(b) A(1,2), B(2,-3) and C(-2,3) are three points. A point 'P' moves such that $PA^2 + PB^2 = 2PC^2$. Show that the equation to the locus of 'P' is $7x - 7y + 4 = 0$
4) Find the equation of locus of P such that the distance of p from the the origin is twice the distance of p from A(1,2).
5) Find the equation of locus of P which is forms a triangle of area 2 with the points A(1,1), B(-2,3)

TRANSFORMATION OF AXES (Q:12)

1.(a) Find the transformed equation of $2x^2 + 4xy + 5y^2 = 0$, when the origin is shifted to (3,4) by the translation of axes.
1) (b) When the axes are rotated through an angle 45°, the transformed equation of a curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of the curve.
2) When the origin is shifted to (-1,2) by the translation of axis, find the transformed equation of the
(i) $x^2 + y^2 + 2x - 4y + 1 = 0$ (ii) $2x^2 + y^2 - 4x + 4y = 0$
3. Find the transformed equation of $x \cos \alpha + y \sin \alpha = p$ when the axes are rotated through an angle α.
4. Find the transformed equation of $x^2 + 2\sqrt{3}\, xy - y^2 = 2a^2$ when the axes are rotated through an angle $\pi/6$.
5. Find the transformed equation of $3x^2 + 10xy + 3y^2 = 9$ when the axes are rotated through an angle $\pi/4$.

STRAIGHT LINE(Q:13)

1. Find the transform equation $\frac{x}{a}+\frac{y}{b}=1$ into the normal form when a>0 and b>o. if the perpendicular distance of straight line from the origin is p. deduce that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

2. Transform the equation $\sqrt{3}x+y+10=0$ into (a) slope intersect form (b) intercept form (c) normal form.

3.(a) Find the value of 'k' if the lines 2x – 3y + k = 0, 3x – 4y – 13 = 0 and 8x – 11y – 33 = 0 are concurrent.

(b) If the straight lines ax + by + c = 0, bx + cy + a = 0 and cx + ay + b = 0 are concurrent, then prove that $a^3 + b^3 + c^3 = 3abc$.

4(a). Find the equation of line passing through origin and also point of intersection of lines 2x-y+5=0 and x+y+1=0

4(b). Find the value of k, if the angle between the straight lines 4x – y + 7 = 0 and kx – 5y – 9 = 0 is 45°.

5.(a) Find the equation of the straight line perpendicular to the line 2x + 3y = 0 and passing through the point of intersection of the lines x + 3y – 1 = 0 and x – 2y + 4 = 0

(b) Find the equation of the line passing through the point of intersection of 2x + 3y = 1, 3x + 4y = 6 and perpendicular to the line 5x – 2y = 7.

LIMITS & CONTINUITY (Q:14)

1.Show that f(x) = $\begin{cases} \frac{\cos ax-\cos}{x^2} & if\ x \neq 0 \\ \frac{1}{2}(b^2-a^2) if\ x=0 \end{cases}$, where a and b are real constants is continuous at 0.

2 (b) Compute $\lim_{x\to 0}\frac{\cos ax-\cos bx}{x^2}$ (b) Compute $\lim_{x\to 2}\frac{2x^2-7x-4}{(2x-1)(\sqrt{x}-2)}$

3.(a) If f given by f(x) = $\begin{cases} k^2x-k & if\ x \geq 1 \\ 2 & if\ x<1 \end{cases}$ is a continuous function on R, then find the values of k.

(b) If f is define by f(x) = $\begin{cases} \frac{\sin 2x}{x} & if\ x \neq 0 \\ 1 & if\ x=0 \end{cases}$, f is continuous at 0

DIFFERENTIATION (Q:15)

1. Find the derivatives of the following functions from the first principles

1) sin 2x 2) tan 2x 3) sec 3x 4)ax^2+bx+c 5) $\sqrt{x+1}$ 6) cotx

2.(a) If sin y = x. sin (a + y) prove that $\frac{dy}{dx} = \frac{sin^2 (a+y)}{\sin a}$

(b) If $x^y = e^{x-y}$ prove that $\frac{dy}{dx} = \frac{\log x}{(1+logx)^2}$

3. if y=ae^{nx}+be^{-nx} then prove that y^n=n^2y

RATE MEASURE (Q:16)

1) A balloon, which always remains spherical on inflation, is being inflated by pumping in 900 cubic centimeters of gas per second. Find the rate at which the radius of balloon increases when the radius is 15 cm.

2) The radius of sphere is measured as 14 cm later it was found that is an error 0.2cm in measuring the radius. Find the approximate error in surface area of sphere.

3a) A particle is moving along a line according to s = f(t) = $4t^3 – 3t^2 + 5t – 1$, where s is measured in meters and ‘t’ is measured in seconds. Find the velocity and acceleration at time t. At what time acceleration is zero?

b) A stone is dropped into a quiet lake and ripples moves in circles at the speed of 5cm/sec. At the instant when the radius of circular ripple is 8 cm., how fast is the enclosed area increases?

4) A particle is moving in a straight line so that after t seconds, its distance s (in cms) from a fixed point on the line is given by s = f(= $8t + t^3$. Find

i) velocity at time t = 2 sec ii) the initial velocity iii) acceleration at t = 2 sec.

TANGENTS AND NORMALS (Q:17)

1. Show that at any point (x,y) on the curve y = $be^{x/a}$, the length of the sub tangent is a constant and the length of the subnormal is $\frac{y^2}{a}$

2. Find the length of normal and subnormal at a point ‘m’ the curve y = $\frac{a}{2}(e^{\frac{x}{a}} + e^{\frac{-x}{a}})$

3a). Find the equations of tangents and normal to the curve $y^4 = ax^3$ at (a,a)

3b). Show that the curves $6x^2 – 5x + 2y = 0$ and $4x^2 + 8y^2 = 3$ touch each other at $\left(\frac{1}{2}, \frac{1}{2}\right)$

1st YEAR MATHS-1B MOST IMPORTANT VSAQ QUESTIONS

QUESTION NUMBER QNO-1

1. Find the value of x, if the slope of the line passing through (2, 5) and (x, 3) is 2.
2. Find the value of y, if the line joining the points (3, y) and (2, 7) is parallel to the line joining the points (-1, 4) and (0, 6).
3. a) Find the equation of the straight line passing through (-4, 5) and cutting off equal and non-zero intercepts on the coordinate axes.

   b). Find the equation of the straight line passing through (-2, 4) and making non-zero intercepts whose sum is zero.

4.(a)Transform the equation √3x + y = 4 into (i) slope-intercept form (ii) intercept form (iii) normal form.

4 (b)Transform the equation 4x – 3y + 12 = 0 into (i) slope-intercept form (ii) intercept form (iii) normal form.

4(c)Transform the equation x + y – 2 = 0 into (i) slope-intercept form (ii) intercept form (iii) normal form.

5. Transform the equation x + y + 1 = 0 into normal form.

QUESTION NUMBER QNO-2

1) If the area of the triangle is formed by the straight lines, x = 0, y = 0, and 3x + 4y = a [a > 0] is ‘6’. Find the value of ‘a’.
2) Find the value of p, if the straight lines x + p = 0, y + 2 = 0 and 3x + 2y + 5 = 0 are concurrent.
3) Find the ratio in which the straight line 2x + 3y = 5 divides the line joining the points (0, 0) and (-2, 1).
4) Find the distance between the parallel straight lines 3x + 4y – 3 = 0 and 6x + 8y – 1 = 0.
5) Find the value of ‘k’, if the angle between the straight lines 4x – y + 7 = 0 and kx – 5y – 9 = 0 is 45°.

QUESTION NUMBER QNO-3

1a) Find the distance between the points (3, 4, -2) and (1, 0, 7).

1b) Find the centroid of the triangle whose vertices are (5, 4, 6), (1, -1, 3) and (4, 3, 2).

2a) Find the centroid of the tetrahedron whose vertices are (2, 3, -4), (-3, 3, -2), (-1, 4, 2), (3, 5, 1).

2b) If (3, 2, -1), (4, 1, 1) and (6, 2, 5) are three vertices and (4, 2, 2) are the centroid of a tetrahedron, find the fourth vertex.

3) Find the fourth vertex of the parallelogram whose consecutive vertices are (2, 4, -1), (3, 6, -1) and (4, 5, 1).

QUESTION NUMBER QNO-4

1Q) Reduce the equation x + 2y – 3z – 6 = 0 of the plane to the normal form.

2Q) Find the equation of the plane whose intercepts on X, Y, Z axes are 1, 2, 4 respectively.

3Q) Find the directions of the normal to the plane x + 2y + 2z – 4 = 0.

4Q) Write the equation of the plane 4x – 4y + 2z + 5 = 0 in the intercept form.

5Q) Find the angle between the planes x + 2y + 2z – 5 = 0 and 3x + 3y + 2z – 8 = 0.

QUESTION NUMBER QNO-5 & 6

1) $\lim_{x\to 3} \frac{x^2-8x+15}{x^2-9}$

2) $\lim_{x\to 0} \frac{e^{3x}-1}{x} = 3$

3) $\lim_{x\to 0} \frac{e^{\sin x}-1}{x}$

4) $\lim_{x\to 0} \frac{a^x-1}{b^x-1}$

5) $\lim_{x\to 0} \frac{e^x-1}{\sqrt{1+x}-1}$

6) $\lim_{x\to \infty} \frac{11\ ^3-3x+4}{13x^3-5x^2-7}$

7) $\lim_{x\to \infty} \frac{x^2+5x+2}{2x^2-5x+1}$

8) $\lim_{x\to a} \frac{\tan(x-a)}{x^2-a^2}$

9) $\lim_{x\to 0} \left(\frac{\sin ax}{\sin bx}\right)$

10) $\lim_{x\to 0} \frac{\cos ax-\cos b}{x^2}$

11) $\lim_{x\to 0} \frac{e^{7x}-1}{x} = 3$

12) $\lim_{x\to 2} \frac{x-2}{x^2-8}$

13) $\lim_{x\to 0} \left(\frac{1-cotx}{x}\right)$

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

15) $\lim_{x\to 0} \left(\frac{1-cosnx}{1-cosmx}\right)$

16) $\lim_{x\to 2^-} \frac{|x-2|}{x-2}$ = -1

QUESTION NUMBER QNO-7& 8)

1) If f(x) = 7^{x3+3x} (x > 0), then find f'(x).

2) If f(x) = log(sec x + tan x), find f'(x).

3) If f(x) = 1 + x + x^2 + ... + x^{100}, then find f'(1).

4) $\lim_{x\to 0}$ sin (logx) find $f'(x)$

5) f(x) = $(x^3 + 6x^2 + 12x - 13)^{100}$ find $f'(x)$

6) Find the derivatives of the following functions f(x)

(i) $\sqrt{2x-3} + \sqrt{7-3x}$ (ii) 5sinx+$e^x logx$ (iii) $e^x + sinxcosx$ (iv) $5^x + logx + x^3e^x$ (v)$\frac{1}{a^3+bx+c}$

7) Find the derivatives of the following functions f(x)

(i) $cot^n x$ (ii)tan(e^x) (iii)cos(logx+e^x) (iv) $\frac{1-cos2x}{1+cos2x}$

QUESTION NUMBER QNO-9

1) If y = x^2 + 3x + 6, find Δy and dy when x = 10, Δx = 0.01.

2) Find Δy and dy for the function y = e^x + x when x = 5, Δx = 0.02.

3) Find the approximate value of $\sqrt{82}$

QUESTION NUMBER QNO-10

1) State Rolle's mean square value Theorem

2) State Lagrange's mean value theorem

2) Verify Rolle's Theorem for the function $y = f(x) = x^2 + 4$ on [-3,3]

3) Verify Rolle's Theorem for the function $x^2 - 1$ on [-1,1]

4) Verify Lagrange's mean value theorem for the function $x^2 - 1$ on [2,3]

5) Verify Lagrange's mean value theorem for the function $f(x) = x^2$ on [2,4]