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MATHS

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MOST IMPORTANT QUESTIONS

Locus Short Answer Type Questions

1. $A(1, 2), B(2, -3), C(-2, 3)$ are three points. A point P moves such that $PA^2 + PB^2 = 2PC^2$. Show that the locus of P is $7x - 7y + 4 = 0$

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2. Find the equation of locus of P, if the line segment joining (2,3) & (-1,5) subtends a right angle at P.

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3. The ends of the hypertenuse of right angled triangle are $(0, 6), (6, 0)$. The locus of the third vertex is

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4. Find the the locus of the third vertex of a right angled triangle, the ends of whose hypotenuse are (4,0) and (0,4).

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5. A(5,3) and B(3,-2) are 2 fixed points. Find the equation of locus of P, so that the area of $\triangle PAB$ is 9sq. Units.

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6. Find the locus of P(x,y) which moves such that its distances from A(5,-4),B(7,6) are in the ratio 2:3.

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7. Find the equation of the locus of P, if A=(2,3), B=(2,-3) and PA +PB =8.

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8. Find the equation of locus of P if $A = (4, 0), B(-4, 0)$ and $|PA - PB| = 4$

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9. Find the equation of locus of P if $A = (4, 0), B(-4, 0)$ and $|PA - PB| = 4$

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10. Find the equation of locus of a point P such that the distance of P from the origin is twice the distance of P from A(1,2).

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Transformation Of Axes Short Answer Type Questions

1. When the origin is shifted to (-1,2) by the translation of axes, find the transformed equation $x^2 + y^2 + 2x - 4y + 1 = 0$.

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2. When the origin is shifted to the point (2 , 3) the transformed equation of a curve is $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$. Find the original equation of curve.

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3. When the axes rotated through an angegle $\frac{\pi}{4}$, find the transformed equation of $3x^2 + 10xy + 3y^2 = 9$.

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4. When the axes are rotated through an angle $\pi/6$. Find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$.

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5. When the axes are rotated through an angle α, find the transformed equation of $x\cos\alpha + y\sin\alpha = p$.

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6. 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.

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Straight Lines Very Short Answer Type Questions

1. Find the value of x, if the slope of the line passing through (2,5) and (x,3) is 2.

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2. Find the value of y, if the line joining (3,y) and (2,7) is parallel to the line joining the points (-1,4) and (0,6).

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3. Find the equation of the straight line passing through the points $\left(at_1^2, 2at_1\right), \left(at_2^2, 2at_2\right)$.

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4. Find the equation of the straight line passing through $(-4, 5)$ and cutting off equal intercepts on the coordinate axes.

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

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6. Transform the equation $\sqrt{3}x + y = 4$ into slope intercept form

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7. Transform the equation $\sqrt{3}x + y = 4$ into intercept form

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8. Transform the equation $\sqrt{3}x + y = 4$ into

Normal form

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9. Transform the equation of $x + y + 1 = 0$ into

Normal form

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10. Find the equation of line parallel to 2x + 3y + 7 = 0 and passing through (5, 4).

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

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12. The area of the triangle formed by the line $x\cos\alpha + y\sin\alpha = p$ with the coordinate axes is

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13. Find the value of a it the area of the triangle formed by the liners x=0,y=0,3x+4y=a is 6 sq units.

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14. Find the value of p, if the lines 3 x + 4 y = 5 , 2 x + 3y = 4 , px + 4y = 6 are concurrent.

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15. Find the value of p if the straight lines $x + p = 0, y + 2 = 0, 3x + 2y + 6 = 0$ are

concurrent.

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16. Find the point of concurrence of the set of lines

$(2+5k)x-3(1+2k)y+(2-k)=0$

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17. Find the the value of p if the straight lines $3x+7y-1=0$ and $7x-py+3=0$ are mutually perpendicular.

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18. Find the value of k if the angle between the straight $kx + y + 9 = 0, 3x - y + 4 = 0$ is $\pi/4$

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19. Find the distance between the parallel lines $5x - 3y - 4 = 0, 10x - 6y - 9 = 0.$

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Straight Lines Short Answer Type Questions

1. Transform the equation $\frac{x}{a}+\frac{y}{b}=1$ into normal form where $a>0, b>0$. If the perpendicular distance of the straight line from the Origin is p then deduce that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

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2. Find the value of k if the lines $2x-3y+k=0, 3x-4y-13=0, 8x-11y-33=0$ are concurrent.

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3. Find the equation of the line perpendicular to the line $3x + 4y + 6 = 0$ and making intercept -4 on X-axis.

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4. Find the equation of the straight line parallel to $3x + 4y = 7$ and passing through the point of intersection of the lines $x - 2y - 3 = 0$ and $x + 3y - 6 = 0$.

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5. Find the equation of the line passing through the point of intersection of $2x + 3y = 1, 3x + 4y = 6$ and perpendicular to the lines $5x - 2y = 7$

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6. Find the equation of the straight line passing through the point of intersection of the lines $x + y + 1 = 0$ and $2x - y + 5 = 0$ and containing the point $(5, -2)$.

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7. Find the value of k if the angle between the straight lines $4x - y + 7 = 0, kx - 5y - 9 - 0$ is 45°

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8. Find the points on the line $3x - 4y - 1 = 0$ which are at a distance of 5 units from the point (3,2).

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9. Find the image of (1-2) in the line $2x - 3y + 5 = 0$.

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Straight Lines Long Answer Type Questions

1. Find the circumcenter of the triangle whose vertices are (-2,3) , (2 , -1) , (4 , 0) .

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2. Find the circumcentre of the triangle whose vertices are (1,3) (-3,5) and (5,-1).

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3. Find the circumcentre of the triangle whose vertices are (1,3) (0,-2) and (-3,1).

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4. Find the orthocentre of the triagle whose vertices are $(-2, -1)(6, -1), (2, 5)$.

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5. Find the orthocentre of the triangle whose vertices are $(5, -2), (-1, 2), (1, 4)$.

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6. Find the orthocentre of the triangle whose vertices are $(-5, -7), (13, 2), (-5, 6)$

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7. Find the circumcentre of the triangle whose sides are $3x - y - 5 = 0, x + 2y - 4 = 0$ and $5x + 3y + 1 = 0$.

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8. Find the orthocentre of the triangle whose sides are $7x + y - 10 = 0, x - 2y + 5 = 0, x + y + 2 = 0$

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9. A : The foot of the perpendicular from (3, 4) on the line $3x - 4y + 5 = 0$ is $(81/25, 92/25)$

R : If (h, k) is the foot of the perpendicular from (x_1, y_1) to the line $ax + by + c = 0$ then $\frac{h - x_1}{a} = \frac{h - k_1}{b} = \frac{-(ax_1 + by_1 + c)}{a^2 + b^2}$

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10. A : The image of the origin with respect to the line $x + y + 1 = 0$ is (-1, -1)

R : If (h, k) is the image of (x_1, y_1) with respect to the

line $ax + by + c = 0$ then

$$\frac{h - x_1}{a} = \frac{h - k_1}{b} = \frac{-2(ax_1 + by_1 + c)}{a^2 + b^2}$$

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Pair Of Straight Lines Long Answer Type Questions

1. If θ is the angle between the pair of lines represented by $ax^2 + 2hxy + by^2 = 0$, then prove that $\cos\theta = \frac{|a + b|}{\sqrt{(a - b)^2 + 4h^2}}$

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2. Show that the equation of the pair of lines bisecting the angles between the pair of bisectors of the angles between the pair of lines $ax^2 + 2hxy + by^2 = 0$ is $(a-b)(x^2 - y^2) + 4hxy = 0$

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3. Show that the product of the perpendicular from (alpha,beta) to the pair of lines $S \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\frac{|a\alpha^2 + 2h\alpha\beta + 2g\alpha + 2f\beta + c|}{\sqrt{(a-b)^2 + 4h^2}}$ Hence or otherwise find the product of the perpendicular from the origin

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4. Prove that the aea of the triangle formed by $y = x + c$ and the pair of lines $ax^2 + 2hxy = by^2 = 0$ is $\frac{e^2\sqrt{h^2 - ab}}{|a + b + 2h|}$ sq. units.

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5. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of lines then prove that

$\triangle = abc + 2fgh - af^2 - bg^2 - ch^2 = 0.$

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6. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that $h^2 = ab$.

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7. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that $h^2 = ab$.

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8. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that $af^2 = bg^2$

.

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9. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that the distance between the parallel lines is $2\sqrt{\frac{g^2 - ac}{a(a+b)}}$ or $2\sqrt{\frac{f^2 - bc}{b(a+b)}}$.

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10. S.T the equation $2x^2 - 13xy - 7y^2 + x + 23y - 6 = 0$ represents a pair of straight lines. Also find the angle between them and the coordinates of the point of intersection of the lines.

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11. 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.

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12. 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 .

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13. Show that the lines joining the origin with the points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ with the line $3x - y = 2$ are mutually perpendicular.

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

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15. Find the condition for the lines joining the originto the points of intersection of the circle $x^2 + y^2 = a^2$ and the line $lx + my = 1$ to coincide.

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

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3 D Coordinates Very Short Answer Type Questions

1. Find x if the distance between (5,-1,7) and (x,5,1) is 9 units.

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2. Show that the points (1,2,3), (2,3,1) and (3,1,2) form an equilateral triangle.

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3. Show that the points $A = (1, 2, 3), B = (7, 0, 1), C = (-2, 3, 4)$ are colinear.

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4. For what value of t, the points (2,-1,3),(3,-5,t) and (-1,11,9) are collinear

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5. Find the coordinates of the vertex 'C' of ΔABC if its centroid is the origin and the vertices A,B are (1,1,1) are (-2,4,1) respectively.

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

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7. Find the ratio in which the XZ-plane divides line joining A(-2,3,4) and B(1,2,3)

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8. Find the fourth vertex of the parallelogram whose consecutive vertices are

$(2, 4, -1), (3, 6, -1)$ and $(4, 5, 1)$.

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D C S And Dr S Long Answer Type Questions

1. Find the angle between the lines whose direction cosines satisfy the equaitons $l + m + n = 0, l^2 + m^2 - n^2 = 0.$

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2. Find the angle between the lines whose direction cosines are given by the equation 3l + m + 5n = 0 and

6mn - 2nl + 5lm = 0

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3. Find the direction cosines of the two lines which are connected by the relations l + m + n = 0 an mn - 2nl - 2lm = 0.

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4. Find the direction cosines of the two lines which are connected by the relations $l - 5m + 3n = 0, 7l^2 + 5m^2 - 3n^2 = 0$

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5. Show that the lines whose direction cosines are given by $l + m + n = 0$, $2mn + 3nl - 5lm = 0$ are perpendicular to each other.

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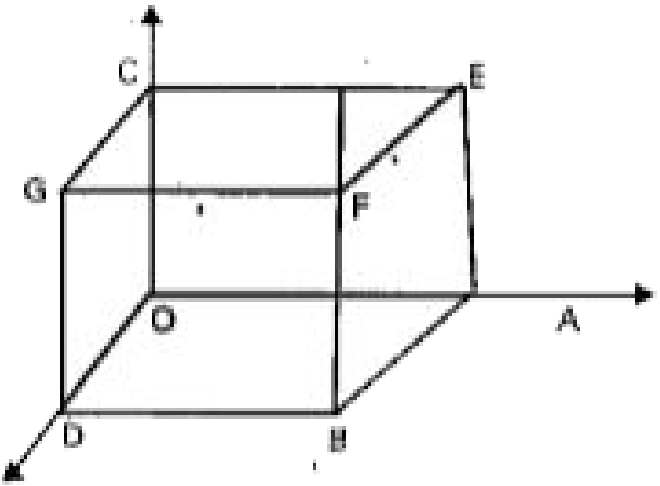
6. Find the angle between the diagonals of a cube .



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7. If a line makes angles $\alpha, \beta, \lambda, \delta$ with the four diagonals of a cube, then show that $\cos^2\alpha + \cos^2\beta + \cos^2\lambda + \cos^2\delta = \frac{4}{3}$.

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Plane Very Short Answer Type Questions

1. Write the equations of the plane $4x - 4y + 2z + 5 = 0$ in the intercept form.

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2. Find the intercepts of the plane $4x + 3y - 2z + 2 = 0$ on the coordinate axes.

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3. Find the equation of the plane which makes intercepts 1,2,4 on the x,y,z - axes respectively.

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4. Reduce the equation $x + 2y - 3z - 6 = 0$ of the plane to the normal form.

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5. Find the direction cosines of the normal to the plane $x + 2y + 2z - 4 = 0$

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6. Find the angle between the planes $x + 2y + 2z - 5 = 0$ and $3x + 3y + 2z - 8 = 0$

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7. Find the angle between the planes 2x - y + z = 6 and x + y + 2 z = 7 .

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8. Find the equation of the plane passing through the point (1,1,1) and parallel to the plane

$x + 2y + 3z - 7 = 0$

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Limits And Continuity Very Short Answer Type Questions

1. Compute the limit of $Lt_{x \to 3} \frac{x^2 - 8x + 15}{x^2 - 9}$

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2. Compute $Lt_{x \to 0} \frac{a^x - 1}{b^x - 1} (a > 0, b > 0, b \neq 1).$

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3. $\mathrm{lt}_{x \to 0} \frac{\sqrt{x+1}-1}{x}$

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4. Compute $\lim_{x \to 0} \left(\frac{e^x - 1}{\sqrt{1+x}-1} \right)$

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5. Compute $Lt_{x \to 0} \frac{3^x - 1}{\sqrt{1+x}-1}$.

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6. Compute $Lt_{x \to 0} \frac{e^{3x} - 1}{x}$.

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7. Compute the following limits

$$Lt_{x \to 0} \frac{\sin ax}{x \cos x}$$

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8. Compute $\underset{x \to 0}{\text{Lt}} \left(\frac{\sin ax}{\sin bx} \right) b \neq 0, a \neq b$

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9. Compute the following limits

$$Lt_{x \to 0} \frac{1 - \cos mx}{1 - \cos nx}, N \neq 0$$

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10. Compute $\lim_{x \to a} \frac{\tan(x-a)}{x^2-a^2}(a \neq 0).$

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11. Show that

$$Lt_{x \to a} \frac{\sin(x-a)\tan^2(x-a)}{(x^2-a^2)^3} = \frac{1}{8a^3}$$

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12. $\text{lt}_{x \to 0} \frac{x \sin a - a \sin x}{x - a}$

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13. Evaluate $Lt_{x \to 0} \frac{e^x - \sin x - 1}{x}$

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14. Evaluate $Lt_{x \to 3} \frac{e^x - e^3}{x - 3}$

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15. Compute the following limits

$Lt_{x \to 0} \left[\frac{\cos ax - \cos bx}{x^2} \right]$

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16. Compute the following limits

$$Lt_{x \to 0} \frac{\sin(a + bx) - \sin(a - bx)}{x}$$

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17. $\lim_{x \to \infty} \frac{3x^2 + 5x + 2}{2x^2 - 3x + 1} =$

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18. Evaluate $Lt_{x \to \infty} \frac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}$

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19. Evaluate the following limits.

$Lt_{x \to \infty} \left(\sqrt{x+1} - \sqrt{x}\right)$

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20. Evaluate $Lt_{x \to \infty} \left(\sqrt{x^2 + x} - x\right)$

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21. Evaluate $Lt_{x \to 0} \dfrac{\sqrt[3]{1+x} - \sqrt[3]{1-x}}{x}$

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22. Evaluate $Lt_{x \to 0} \frac{(1+x)^{1/8} - (1-x)^{1/8}}{x}$

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23. $\text{lt}_{x \to 0} \frac{2|x|}{x} + x + 1$

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24. Compute the following limits.

$Lt_{x \to \infty} \frac{\sqrt{x^2+6}}{2x^2-1}$

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25. Find $Lt_{x \to -\infty} \frac{5x^3 + 4}{\sqrt{2x^4 + 1}}$

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Limits And Continuity Short Answer Type Questions

1. Is f given by $f(x) = \begin{cases} \frac{x^2 - 9}{x^2 - 2x - 3} & \text{if } 0 < x < 5 \text{ and } x \neq 3 \\ 1.5 & \text{if } x = 3 \end{cases}$,

continuous at the point 3.

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2. Check the continuity of function defined b y

$$f(x) = \begin{cases} \frac{1}{2}\left(x^2 - 4\right) & \text{if } 0 < x < 2 \\ 0 & \text{if } x = 2 \\ 2 - \frac{8}{x^3} & \text{if } x > 2 \end{cases}$$ at x=2

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3. Show that

$$f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2}\left(b^2 - a^2\right) & \text{if } x = 0 \end{cases}$$ where a and b are

real constants is continuous at x = 0.

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4. Find the real constants a , b, so that the function f given by $f(x) = \begin{cases} \sin x & \text{if } x \leq 0 \\ x^2 + a & \text{if } 0 < x < 1 \\ bx + 3 & \text{if } 1 \leq x \leq 3 \\ -3 & \text{if } x > 3 \end{cases}$ is continuous on R .

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

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Differentation Very Short Answer Type Questions

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

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2. If $f(x) = xe^x \sin x$ then find $f'(x)$.

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3. If $y = e^{2x}.\log(3x + 4)$ then find $\frac{dy}{dx}$.

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4. Find the derviation of f(x) = sin (logx)

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5. Find $f(x) = 7^{3+3x}(x > 0)$, then find $f'(x)$.

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6. Find the derivative of $y = e^{\sin -1} x$.

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7. Find the derivation of $y = e^{a \sin^{-1} x}$

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8. Find the derivation of $y = \frac{2x + 3}{4x + 5}$

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9. If f(x) = $x^2 2^x \log x$, find f'(x)

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10. If y= log(sec x + tanx), find $\frac{dy}{dx}$

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11. If y = log [sin (log x)] , find $\frac{dy}{dx}$

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12. Find the derivation of $y = \sin^{-1}(\cos x)$

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13. Find the derivative of $\sin^{-1}\left(3x - 4x^3\right)$ with respect of 'x' .

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14. Find the derivative of $\cos^{-1}(4x^3 - 3x)$ w.r.to x.

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15. Find the derivative of $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$

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16. Find $\frac{dy}{dx}$ if $2x^2 - 3xy + y^2 + x + 2y - 8 = 0$.

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17. Find the derivative of $\left[\cot^{-1}(x^3)\right]^2$

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18. If $y = \sec\left(\sqrt{\tan x}\right)$, find $\frac{dy}{dx}$

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19. Find the derivative of $\sin h^{-1}\left(\frac{3x}{4}\right)$

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20. If $x = a\cos^3 t, y = a\sin^3 t,$ find $\frac{dy}{dx}$

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Differentation Short Answer Type Questions

1. Find the derivative of sin2x from the first principle.

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2. Find the derivative of $\cos ax$ from the first Principle.

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3. Find the derivative of $\tan 2x$ from the first principle.

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4. Find the derivative of $\sec 3x$ using first principle.

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5. Find the derivative of $x \sin x$ from the first principle.

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6. Find the derivative of $\cos^2 x$ from the first principle.

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7. Find the derivative of $\cot x$ from the first principle.

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8. $A: If y = x^y$ then $\frac{dy}{dx} = \frac{y^2}{x(1-\log y)}$

If $y = f(x)^y$, then

$$\frac{dy}{dx} = \frac{y^2 f'(x)}{f(x)[1 - y\log f(x)]} = \frac{y^2 f'(x)}{f(x)[1 - \log y]}$$

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9. If $x^y = e^{x-y}$ then $\frac{dy}{dx} =$

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10. Differentiate $\frac{\tan^{-1}(2x)}{1-x^2}$ w.r.t $\sin^{-1}\frac{2x}{1+x^2}$.

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11. IF $y - \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, find $\frac{dy}{dx}$.

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12. x = a (cost + t sint) , y = a (sint - tcost) find $\frac{dy}{dx}$.

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13. If $y = ax^{n+1} + bx^{-n}$ then show that $x^2 y'' = n(n+1)y$.

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Differentation Long Answer Type Questions

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

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2. If $y=\tan(-1)\left(\frac{\sqrt{(1+x^2)}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right)$ then find $\frac{dy}{dx}$.

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3. Find the derivative of $(\sin x)^{\log x} + x^{\sin x}$.

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4. Find the derivative of $x^{\tan x} + (\sin x)^{\cos x}$ w.r.to x.

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5. If $x^y + y^x = a^b$ then prove that $\frac{dy}{dx} = -\left[\frac{yx^{y-1} + y^x \log y}{x^y \log x + xy^{x-1}}\right]$.

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6. If $f(x) = \sin^{-1}\sqrt{\frac{x-\beta}{\alpha-\beta}}, g(x) = \tan^{-1}\sqrt{\frac{x-\beta}{\alpha-x}}$

then prove that f'(x) = g'(x)

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7. If $y = x\sqrt{a^2+x^2} + a^2\log\left(x+\sqrt{a^2+x^2}\right)$, then show that $\frac{dy}{dx} = 2\sqrt{a^2+x^2}$.

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Application Of Differenciation Very Short Answer Type Questions

1. Find Δy and dy for the function $y = x^2 + x$, when x=10, $\Delta x = 0.1$

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2. If $y = x^2 + 3x + 6$ then find $\triangle y$ and dy when $x = 10, \triangle x = 0.01.$

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3. Find (Δy) and dy if $y = 5x^2 + 6x + 6, x = 2$ and $\Delta x = 0.001$

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4. Find the approximate value of $\sqrt{82}$

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5. Find the approximate value of $\sqrt[3]{65}$

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6. Find the approximate value of $\sqrt[3]{999}$

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7. Find the approximate value of $\sqrt[4]{17}$

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8. If the increase in the side of a square is 2% then find the approximate percentage of increase in the area of the square.

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9. If the increase in the side of a square is 4% then find the approximate percentage of increase in the area of the square.

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Tangents Normals Short Answer Type Questions

1. Find the equations of tangent and normal to the curve xy = 10 at (2 , 5)

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2. Find the equation of tangent & normal to the curve $y = 5x^4$ at (1,5)

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

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4. The equation of tangent to the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n$ = 2at the point (a,b) is

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5. S.T the tangent at any point θ on the curve $x = c\sec\theta, y = c\tan\theta$ is $y\sin\theta = x - \cos\theta.$

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6. Find the lengths of subtangent and subnormal at a point on the curve $y = b\sin\left(\frac{x}{a}\right)$

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7. Show that at any point (x,y) on the curve $y = b^{\frac{x}{a}}$, the length of the subtangent is a constant and the length of the subnormal is $\frac{y^2}{a}$.

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8. Find the value of k, so that the length of the subnormal at any point on the curve $y = a^{1-k}x^k$ is a

constant

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9. S.T the curves $6x^2 - 5x + 2y = 0, 4x^2 + 8y^2 = 3$ touch each other at $\left(\frac{1}{2}, \frac{1}{2}\right)$.

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Tangents Normals Long Answer Type Questions

1. IF the tangent at a point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ intersects the coordinate axes in A and B then show that the length AB is a constant.

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2. IF the tangent at any point P on the curve $x^m y^n = a^{m+n}$, $mn \neq 0$ meets the coordinate axes in A.B then show that $AP : BP$ is a constant.

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3. Find the length of subtangent subnormal at a pont t on the curve $x = a(\cos t + \sin t) y = a(\sin t - t \cos t)$

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4. At any point t on the curve x=a(t+sint), y=a(1-cost), find the lengths of tangent, normal, subtangent and subnormal.

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5. Find the angle between the curves $y^2 = 8x$ and $4x^2 + y^2 = 32$

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6. Find the angle between the curves xy=2 and $x^2 + 4y = 0$

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7. S.T the curves $y^2 = 4(x+1), y^2 = 36(9-x)$ intersect orthogonally.

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8. Show that the tangent at $P(x_1, y_1)$ on the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is $xx_1^{\frac{-1}{2}} + yy_1^{\frac{-1}{2}} = a^{\frac{1}{2}}$

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9. Find the condition for the orthogonality of the curves $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$

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Rate Measure Short Answer Type Questions

1. A particle is moving in a straight line so that after t seconds its distance is s (in cms) from a fixed point on the line is given by $s = f(t) = 8t + t^3$. Find the velocity at time t= 2sec (ii) the initial velocity can acceleration at t=2 sec

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2. A particle is moving along a line according $s = f(t) = 8t + t^3$. Find the initial velocity

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3. A particle is moving along a line according $s = f(t) = 8t + t^3$. Find acceleration at t = 2 sec.

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4. The distance-time formula for the motion of a particle along a straight line is $s = t^3 - 9t^2 + 24t - 18$. Find when and where the velocity is zero.

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5. A particle is moving along a line according $s = f(t) = 4t^3 - 3t^2 + 5t - 1$ where s is measured in meters and t is measured in seconds. Find the velocity and acceleration at time t. At what time the acceleration is zero.

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6. The displacement s of a particle travelling in a straight line in t seconds is given by $s = 45t + 11t^2 - t^3$. Find the time when the particle comes to rest.

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7. The volume of a cube is increasing at the rate of $8cm^3/\sec$. How fast is the surface area increasing when the length of an edge is 12 cm ?

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8. The volume of a cube is increasing at a rate of 8 cubie centimeters per second. How fast is the surface area increasing when the length of the edge is 12 cm?

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

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10. A container is in the shape of an inverted cone has height 8m and radius 6m at the top. If it is filled with water at the rate of $2m^3$/minute, how fast is the height of water changing when the level is 4m?

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11. 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 in 15 cm.

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Mean Value Theorem Very Short Answer Type Questions

1. Define Rolles mean value theorem.

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2. State Lagrange's mean value theorem.

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3. Verify Rolle's theroem for the function $x^2 - 1$ on [-1,1]`.

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

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5. Verify Rolle's theorem for the function $f(x) = x^2 - 5x + 6$ in the interval [-3,8]

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6. Verify mean value theorem for the function $f(x) = x^2$ on [2,4]

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7. Verify the conditions of Lagrange's mean value theorem for the function $x^2 - 1$ on [2,3]

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Maxima Minima Long Answer Type Questions

1. The sum of two numbers is 16. Find the numbers so that the sum of square is minimum.

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2. Find the positive integers x and y such that $x + y = 60$ and xy^3 is maximum.

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3. Find the maximum area of the rectangle that can be formed with fixed perimeter 20.

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4. From a rectangular sheet of dimension $30cm \times 80cm$, four equal squares of side x cm. are removed at the corners, and the sieds 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.

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5. A window is in the shap of a rectangle surmounted by a semicircle. If the perimeter of the window is 20 ft, find the maximum area.

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6. 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 pieces of wire so that the sum of areas is least ?

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7. Show that when the curved surface of a is right circular cylinder inscribed in a sphere of radius R is maximum , then the height of the cylinder is $\sqrt{2R}$.

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8. The profit function P(x) of a company selling x items per day is given by $P(x) = (150 - x)x - 1000$. Find the number of items that the company should manufacture to get maximum profit. Also find the maximum profit.

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