MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

PAIR OF STRAIGHT LINES

Example

1. Find the joint equation of lines y =x and y=-x.

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2. Find the separate equation of lines represented by the equation by the equation $x^2 - 6xy + 8y^2 = 0$

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3. Find the condition that the slope of one of the lines represented by $ax^2 + 2hxy + by^2 = 0$ should be n times the slope of the other .

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4. If the slope of one of the lines represented by $ax^{22}hxy + by^2 = 0$ be the nth power of the , prove that , $(ab^n)^{\frac{1}{n+1}} + (a^n b)^{\frac{1}{n+1}} + 2h = 0.$

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5. Find the product of the perpendiculars drawn from the point (x_1, y_1) on the lines $ax^2 + 2hxy + by^2 = 0$

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6. Find the condition that the one of the lines given by $ax^2 + 2hxy + by^2 = 0$

may be perpendicular to one of the lines given by $a'x^2 + 2h'xy + b'y^2 = 0$

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7. Show that the centroid $(x', y')ofthe \triangle withsides$ax^2+2hxy+by^2=0 and lx +my =1, is given by

$$\frac{x'}{bl - hm} = \frac{y'}{am - hl} = \frac{2}{3(am^2 - 2hlm + bl^2)}$$

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8. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and lx+my+n=0 is $\frac{n^2\sqrt{(h^2 - ab)}}{|(am^2 - 2hlm + bl^2)|}$

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9. Show that the two straight lines

$x^2\left(\tan^2\theta+\cos^2\theta\right)-2xy\tan\theta+y^2\sin^2\theta=0$

Move with the axis of x angles such that the difference of their tangents is 2 .

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10. The angle between the lines $\left(x^2+y^2\right)\sin^2\alpha=(x\cos\beta-y\sin\beta)^2$ is

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11. Show that the angle between the lines given by $\left(a+2hm+bm^2\right)x^2+2\left\{(b-a)m-\left(m^2-1\right)h\right\}xy+\left(am^2-2hm+b\right)$ is the same whatever be the value of m „.

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12. Show that the straight lines $x^2 + 4xy + y^2 = 0$ and the line x-y=4 form an equilateral triangle .

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13. If two of the three lines represented by $ax^3 + bx^2y + cxy^2 + dy^3 = 0$ may be at right angles then

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14. Find the equation of the bisectors of the angle between the lines represented by $3x^2 - 5xy + 4y^2 = 0$

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15. The lines $y = mx$ bisects the angle between the lines $ax^2 + 2hxy + by^2 = 0$ if

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16. If the pair of straight lines $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ are such that each pair bisects the angle between the other pair , then prove that $pq = -1$.

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17. If the lines given by $ax^2 + 2hxy + by^2 = 0$ are equally inclined to the lines given by $ax^2 + 2hxy + by^2 + \lambda(x^2 + y^2) = 0$, then

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18. Show that the pair of lines given by $a^2x^2 + 2h(a + b)xy + b^2y^2 = 0$ is equally inclined to the pair given by $ax^2 + 2hxy + by = 0$.

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19. If the lines represented by $x^2 - 2pxy - y^2 = 0$ are rotated abouu the origin through ann angle θ, one clockwise direction and other in anti-clockwise direction, then the equationn of the bisectors of the angle between the lines in the new position is

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20. For what value of λ does the equation $12x^2 - 10xy + 2y^2 + 11x - 5y + \lambda = 0$ represent a pair of straight lines ? Find their equations and the angle between them.

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21. Prove that the equation $8x^2 + 8xy + 2y^2 + 26x + 13y + 15 = 0$ represents a pair of parallel straight lines . Also find the perpendicular distance between them .

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22. Find the combined equation of the straight lines passing through the point (1,1) and parallel to the lines represented by the equation . $z^2 - 5xy + 4y^2 + x + 2y - 2 = 0$.

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23. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of lines , prove that the area of the triangle formed by their bisectors and axis of x is

$$\frac{\sqrt{(a-b)^2 + 4h^2}}{|2h|} \cdot \left| \frac{ca - g^2}{ab - h^2} \right|$$

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24. Find the point of inersection of lines represented by $2x^2 - 7xy - 4y^2 - x + 22y - 10 = 0$

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25. Find the new equation of curve $12x^2 + 7xy - 12y^2 - 17x - 31y - 7 = 0$ after removing the first degree terms.

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26. Transform the equation $x^2 + 4xy + y^2 - 2x + 2y + 4 = 0$ into the form

$$\frac{y'^2}{b^2} - \frac{x'^2}{a^2} = 1$$

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27. Prove that the angle between the lines joining the origin to the points of intersection of the straight line $y = 3x + 2$ with the curve $x^2 + 2xy + 3y^2 + 4x + 8y - 11 = 0$ is $\tan^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

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28. Find the equation to the pair of straight lines joining the origin to the intersections oi the straight line $y = mx + c$ and the curve $x^2 + y^2 = a^2$. Prove that they are at right angles if $2c^2 = a^2(1 + m^2)$.

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29. Prove that the pair of lines joining the origin to the intersection of the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1by$

the line lx+my+n=0 are coincident, if a $a^2l^2 + b^2m^2 = n^2$

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30. The pair of lines joining origin to the points of intersection of, the two curves $ax^2 + 2hxy + by^2 + 2gx = 0$ and $a'x^2 + 2h'xy + b'y^2 + 2g'x = 0$ will be at right angles, if

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31. If the pairs of lines $x^2 + 2xy + ay^2 = 0$ and $ax^2 + 2xy + y^2 = 0$ have exactly one line in common, then the joint equation of the other two lines is given by $3x^2 + 8xy - 3y^2 = 0$ $3x^2 + 10xy + 3y^2 = 0$ $y^2 + 2xy - 3x^2 = 0$ $x^2 + 2xy - 3y^2 = 0$

A. $3x^2 + 8xy - 3y^2 = 0$

B. $3x^2 + 10xy + 3y^2 = 0$

C. $x^2 + 2xy - 3y^2 = 0$

D. $3x^2 + 2xy - y^2 = 0$

Answer: b

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32. The combined equation of the lines L_1 and L_2 is $2x^2 + 6xy + y^2 = 0$, and that of the lines L_3 and L_4 is $4x^2 + 18xy + y^2 = 0$. If the angle between L_1 and L_4 be α , then the angle between L_1 and L_3 will be .

A. $\frac{\pi}{2} - \alpha$

B. $\frac{\pi}{4} + \alpha$

C. α

D. 2α

Answer: c

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33. If the pair of lines $\sqrt{3}x^2 - 4xy + \sqrt{3}y^2 = 0$ is rotated about the origin by $\frac{\pi}{6}$ in the anticlockwise sense, then find the equation of the pair in the new position.

A. $x^2 - \sqrt{3}xy = 0$

B. $y^2 - \sqrt{3}xy = 0$

C. $\sqrt{3}x^2 - xy = 0$

D. $\sqrt{3}y^2 - xy = 0$

Answer: c

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34. If the pair of lines $ax^2 - 2xy + by^2 = 0$ and bx^2-2xy+ay^2=0` be such that each pair bisects the angle between the other pair , then |a-b| equals to

A. 1

B. 2

C. 3

D. 4

Answer: b

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35. The equation of line which is parallel to the line common to the pair of lines given by $3x^2 + xy - 4y^2 = 0$ and $6x^2 + 11xy + 4y^2 = 0$ and at a distance of 2 units from it is

A. $3x - 4y = -10$

B. $x - y = 2$

C. $3x + 4y = 10$

D. $2x + y = -2$

Answer: c

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36. The lines joining the origin to the point of intersection of $x^2 + y^2 + 2gx + c = 0$ and $x^2 + y^2 + 2fy - c = 0$ are at right angles if

A. $g^2 + f^2 = c$

B. $g^2 - f^2 = c$

C. $g^2 - f^2 = 2c$

D. $g^2 + f^2 = c^2$

Answer: c

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37. The lines joining the origin to the point of intersection of The lines joining the origin to the point of intersection of $3x^2 + mxy = 4x + 1 = 0$ and $2x + y - 1 = 0$ are at right angles. Then which of the following is not a possible value of m? -4 (b) 4 (c) 7 (d) 3

A. -4

B. 3

C. 4

D. 7

Answer: (a,b,c,d)

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38. The lines $(lx+my)^2-3(mx-ly)^2=0$ and $lx+my+n=0$ forms

A. an isosecles triangle

B. a right angled triangle

C. an equilateral triangle

D. None of these

Answer: (a,c)

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39. If the equation $ax62-6xy+y^2+bx+cy+d=0$ represents a pair of lines whose slopes are m and m^2, then the values (s) of a is / are

A. -27

B. -8

C. 8

D. 27

Answer: (a,c)

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40. Consider the equation of a pair of straight lines as

$\lambda xy - 8x + 9y - 12 = 0$

A. 0

B. 2

C. 4

D. 6

Answer: d

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41. The point of intersection of lines is (α, β) , then the equation whose roots are α, β, is

A. $4x^2 + x - 8 = 0$

B. $6x^2 + x - 12 = 0$

C. $4x^2 - x - 8 = 0$

D. $6x^2 - x - 12 = 0$

Answer: b

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42. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product , then the value of c is

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43. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$,then value of |c| is

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44. Statement I . The combined equation of l_1, l_2 is $3x^2 + 6xy + 2y^2 = 0$ and that of $m_1, m_2 is 5x^2 + 18xy + 2y^2 = 0$. If angle between $l_1, m_2 is \theta$, then angle between $l_2, m_1 is \theta$.

Statement II . If the pairs of lines $l_1 l_2 = 0, m_1 m_2 = 0$ are equally inclinded that angle between l_1 and m_2= angle between l_2 and m_1.

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45. Statement I . The equation $2x^2 - 3xy - 2y^2 + 5x - 5y + 3 = 0$ represents a pair of perpendicular straight lines.

Statement II A pair of lines given by $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ are perpendicular if $a + b = 0$

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46. If the lines represented by $2x^2 - 5xy + 2y^2 = 0$ be the sides of a parallelogram and the line $5x + 2y = 1$ be one of its diagonal. Find the equation of the other diagonal, and area of the parallelogram .

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47. Prove that the equation $(a + 2h + b)x^2 - 2(a - b)xy + (a - 2h + b)y^2 = 0$ represents a pair of lines each inclined at an angle of 45° to one or other of the lines given by , $ax^2 + 2hxy + by^2 = 0$

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48. If $u \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of straight lines , prove that the equation of the third

pair of straight lines passing through the points where these meet the axes is cu+4(fg+ch)xy=0 .

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49. If the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of parallel lines, prove that

$h = \sqrt{ab}$ and $g\sqrt{b} = f\sqrt{a}$ or $(h = -\sqrt{ab}$ and $g\sqrt{b} = -f\sqrt{a})$.

The distance between them is $2\sqrt{\left(\frac{(g^2 - ac)}{a(a+b)}\right)}$.

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50. A parallelogram is formed by the lines $ax^2 + 2hxy + by^2 = 0$ and the lines through (p, q) parallel to them. Show that the equation of the diagonal of the parallelogram which doesn't pass through origin is $(2x - p)(ap + hq) + (2y - q)(hp + bq) = 0$

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51. A point moves so that the distance between the foot of perpendiculars from it on the lines $ax^2 + 2hxy + by^2 = 0$ is a constant $2d$. Show that the equation to its locus is $(x^2 + y^2)(h^2 - ab) = d^2\{(a - b)^2 + 4h^2\}$.

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52. Show that if two of the lines $ax^3 + bx^2y + cxy^2 + dy^2 = 0 (a \neq 0)$ make complementary angles with X -axis in anti -clockwise sense, then a(a-c)+b(b-d)=0 .

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53. Show that the equation $a(x^4 + y^4) - 4bxy(x^2 - y^2) + 6cx^2y^2 = 0$ represents two pairs of lines at right angles and that if $2b^2 = a^2 + 3ac$, the two pairs will coincide.

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54. Show that the locus of a point such that the product of the perpendiculars let fall from it on three lines represented by $ay^3 + by^2 + cyx^2 + dx^3 = 0$ is constant $=k^3$,is $ay^3 + by^2 + cyx^2 + dx^3 = k^2\sqrt{(a-c)^2 + (b-d)^2}$.

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55. if one of the lines given by the equation $ax^2 + 2hxy + by^2 = 0$ coincides with one of the lines given by $a'x^2 + 2h'xy + b'y^2 = 0$ and the other lines representted by them be perpendicular , then .

$\frac{ha'b'}{b'-a'} = \frac{h'ab}{b-a} = \frac{1}{2}\sqrt{(-aa'')}$.

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Exercise For Session 1

1. The lines given by the equation $\left(2y^2+3xy-2x^2\right)(x+y-1)=0$ form a triangle which is

A. equilateral

B. isosceles

C. right angled

D. obtuse angled

Answer: C

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2. Area of the triangle formed by the lines $y^2-9xy+18x^2=0$ and $y=9$ is

A. $27/4$

B. 0

C. $9/4$

D. 27

Answer: A

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3. The equation $3x^2 + 2hxy + 3y^2 = 0$ represents a pair of straight lines passing through the origin . The two lines are

A. real and distinct , if $h^2 > 3$

B. real and distinct , if$h^2 > 9$

C. real and coincident , if $h^2 = 3$

D. real and coincident , if $h^2 > 3$

Answer: B

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4. if one of the lines the pair $ax^2 + 2hxy + by^2 = 0$ bisects the angle between positive directions of the axes , then a, b, h, satisfy the relation

A. $a + b = 2|h|$

B. $a + b = -2h$

C. $a - b = 2|h|$

D. $(a - b)^2 = 4h^2$

Answer: B

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5. If the slope of the lines given by $a^2x^2 + 2hxy + b^2y^2 = 0$ be three times of the other , then h is equal to

A. $2\sqrt{3}ab$

B. $-2\sqrt{3}ab$

C. $\frac{2}{\sqrt{3}}ab$

D. $-\frac{2}{\sqrt{3}}ab$

Answer: C::D

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6. Find the separate equation of two straight lines whose joint equation is ab $\left(x^2-y^2\right)+\left(a^2-b^2\right)xy=0$

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7. Find the coordinates of the centroid of the triangle whose sides are $12x^2-20xy+7y^2=0$ and $2x-3y+4=0$

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8. If the lines $ax^2+2hxy+by^2=0$ be two sides of a parallelogram and the line lx+my=1 be one of its diagonal, show that the equation of the

other diagonal is y (bl-hm)=x(am-hl).

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9. Find the condition that one of the lines given by $ax^2 + 2hxy + by^2 = 0$ may coincide with one of the lines given by $a'x^2 + 2h'xy + b'y^2 = 0$

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Exercise For Session 2

1. The angle between the pair of straight lines $y^2 \sin^2\theta - xy\sin^2\theta + x^2\left(\cos^2\theta - 1\right) = 0$ si

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{2\pi}{3}$

Answer: B

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2. The angle between the lines $ay^2 - \left(1 + \lambda^2\right))xy - ax^2 = 0$ is same as the angle between the line:

A. $5x^2 + 2xy - 3y^2 = 0$

B. $x^2 - 2xy - 3y^2 = 0$

C. $x^2 - y^2 = 100$

D. xy=0

Answer: C::D

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3. Which of the following pair of straight lines intersect at right angles ?

A. $2x^2 = y(x + 2y)$

B. $(x + y)^2 = x(y + 3x)$

C. $2y(x + y) = xy$

D. $y = \bar{+} 2x$

Answer: A

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4. if $h^2 = ab$, then the lines represented by $ax^2 + 2hxy + by^2 = 0$ are

A. Parallel

B. perpendicular

C. coincident

D. None of these

Answer: C

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5. Equation $ax^3 - 9x^2y - xy^2 + 4y^3 = 0$ represents three straight lines.

If the two of the lines are perpendicular , then a is equal to

A. -5

B. 5

C. -4

D. 4

Answer: B::C

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6. Find the angle between the lines whose joint equation is $2x^2 - 3xy + y^2 = 0$

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7. Show that the lines $(1-\cos\theta\tan\alpha)y^2-\left(2\cos\theta+\sin^2 t\hat{a}\tan\alpha\right)xy+\cos t\hat{a}(\cos t\hat{a}+\tan\alpha)x^2$ include an angle α between them .

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8. Find the angle between the lines repersented by the equation $x^2-2pxy+y^2=0$

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9. Show that the lines $x^2-4xy+y^2=0$ and $x+y=1$ form an equilateral triangle and find its area.

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10. Prove that the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my = 1$ isosceles, if $h(l^2 - m^2) = (a - b)m.$

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Exercise For Session 3

1. If the coordinate axes are the bisectors of the angles between the pair of lines $ax^2 + 2hxy + by^2 = 0$, then

A. a=b

B. h=0

C. $a^2 = b = 0$

D. $a + b^2 = 0$

Answer: B

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2. The equation of the bisectors of angle between the lines $x^2 - 4xy + y^2 = 0$ is

A. $\frac{\sqrt{5}-1}{2}$

B. $\frac{\sqrt{5}+1}{2}$

C. $-\left(\frac{\sqrt{5}+1}{2}\right)$

D. $-\left(\frac{\sqrt{5}-1}{2}\right)$

Answer: A::C

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3. If one of the lines of $my^2 + \left(1 - m^2\right)xy - mx^2 = 0$ is a bisector of the angle between lines xy=0 , then $\cos^{-1}(m)$is

A. 0

B. $\pi/2$

C. π

D. $3\pi/2$

Answer: A::C

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4. The bisectors of the angles between the lines $(ax+by)^2 = c(bx-ay)^2, c>0$ are respectively parallel and perpendicular to the line

A. $bx - ay + \mu = 0$

B. $ax + by + \lambda = 0$

C. $ax = by + v = 0$

D. $bx + ay + \tau = 0$

Answer: B

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5. If the pairs of straight lines $ax^2 + 2hxy - ay^2 = 0$ and $bx^2 + 2gxy - by^2 = 0$ be such that each bisects the angles between the other, then

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6. Prove that the lines $2x^2 + 6xy + y^2 = 0$ are equally inclined to the lines $4x^2 + 18xy + y^2 = 0$

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7. 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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8. Prove that the bisectors of the between the lines $ax^2 + acxy + cy^2 = 0$ and $\left(3 + \frac{1}{c}\right)x^2 + xy + \left(3 + \frac{1}{a}\right)y^2 = 0$ are always the same .

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9. The lines represented by $x^2 + 2\lambda xy + 2y^2 = 0$ and the lines represented by $1 + \lambda_x^2 - 8xy + y^2 = 0$ are equally inclined, then

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Exercise For Session 4

1. if $\lambda x^2 + 10xy + 3y^2 - 15x - 21y + 18 = 0$ represents a pair of straight lines. Then , the value of λ is

A. -3

B. 3

C. 4

D. -4

Answer: B

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2. Prove that the equartion $3y^2 - 8xy - 3x^2 - 29x + 3y - 18 = 0$ represents two straight lines. Find also their point of intersection and the angle between them.

A. $\left(1, \frac{1}{2}\right)$

B. $\left(1, -\frac{1}{2}\right)$

C. $\left(-\frac{3}{2}, \frac{5}{2}\right)$

D. $\left(-\frac{3}{2}, -\frac{5}{2}\right)$

Answer: D

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3. if the equation $12x^2 + 7xy - py^2 - 18x + qy + 6 = 0$ represents two perpendicular lines , then the value of p and q are

A. 12,1

B. 12,-1

C. $12, \frac{23}{2}$

D. $-\frac{23}{2}$

Answer: A::C

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4. If the angle between the two lines represented by $2x^2 + 5xy + 3y^2 + 2y + 4 = 0 is \tan^{-1}(m)$, then m is equal to

A. $-\frac{1}{5}$

B. $\frac{1}{5}$

C. $-\frac{3}{5}$

D. $\frac{3}{5}$

Answer: B

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5. The equation of second degree $x^2 + 2\sqrt{2}x + 2y^2 + 4x + 4\sqrt{2}y + 1 = 0$ represents a pair of straight lines.The distance between them is a. 4 b. $\frac{4}{\sqrt{3}}$ c. 2 d. $2\sqrt{3}$

A. 2

B. $2\sqrt{3}$

C. 4

D. $4\sqrt{3}$

Answer: A

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6. Find the area of the parallelogram formed by the lines

$2x^2 + 5xy + 3y^2 = 0$ and $2x^2 + 5xy + 3y^2 + 3x + 4y + 1 = 0$

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7. Find the locus of the incentre of the triangle formed by

$xy - 4x - 4y + 16 = 0$ and $x + y = a(a > 4, a \neq \sqrt{2}$ and a is the paran

.

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8. If the equation $2hxy + 2gx + 2fy + c = 0$ represents two straight lines, then show that they form a rectangle of area $\frac{|fg|}{h^2}$ with the coordinate axes.

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9. Find the area of the triangle formed by the lines represented by $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ and axis of x .

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10. Find the combined equation of the straight lines passing through the point (1,1) and parallel to the lines represented by the equation . $z^2 - 5xy + 4y^2 + x + 2y - 2 = 0$.

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Exercise For Session 5

1. If the straight lines joining origin to the points of intersection of the line x+y=1 with the curve $x^2 + y^2 + x - 2y - m = 0$ are perpendicular to each other , then the value of m should be

A. $-\frac{1}{2}$

B. 0

C. $\frac{1}{2}$

D. 1

Answer: A

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2. The angle between the pair of straight lines formed by joining the points of intersection of $x^2 + y^2 = 4$ and $y = 3x + c$ to the origin is a right angle. Then c^2 is equal to

A. -1

B. 6

C. 13

D. 20

Answer: A

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3. If θ is an angle by which axes are rotated about origin and equation $ax^2 + 2hxy + by^2 = 0$ does not contain xy term in the new system, then prove that $\tan 2\theta = \frac{2h}{a-b}$.

A. $\frac{(a-b)}{2h}$

B. $\frac{2h}{(a+b)}$

C. $\frac{(a+b)}{2h}$

D. $\frac{2h}{(a-b)}$

Answer: A

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4. The lines joining the origin to the points of intersection of $2x^2 + 3xy - 4x + 1 = 0$ and $3x + y = .1$ given by

A. $x^2 - y^2 - 5xy = 0$

B. $x^2 - y^2 + 5xy = 0$

C. $x^2 + y^2 - 5xy = 0$

D. $x^2 + y^2 + 5xy = 0$

Answer: A

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5. The equation of the line joining the origin to the point of intersection of the lines $2x^2 + xy - y^2 + 5x - y + 2 = 0$ is

A. x+y=0

B. x-y=0

C. x-2y=0

D. 2x+y=0

Answer: A

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6. The lines joining the origin to the points of intersection of the line 3x-2y -1 and the curve $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$, are

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7. If the straight line joining the origin and the points of intersection of $y = mx + 1$ and $x^2 + y^2 = 1$ be perpendicular to each other , then find the value of m.

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8. Prove that the straight lines joining the origin to the point of intersection of the straight line $hx + ky = 2hk$ and the curve $(x - k)^2 + (y - h)^2 = c^2$ are perpendicular to each other if $h^2 + k^2 = c^2$.

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9. Show that for all values of λ, the lines joining the origin to the points common to $x^2 + 2hxy - y^2 + gx + fy = 0$ and fx -gy= λ are at right angles .

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10. Find the equations of the straight lines joining the origin to the points of intersection of $x^2 + y^2 - 4x - 2y = 0$ and $x^2 + y^2 - 2x - 4y = 4$.

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Exercise Single Option Correct Type Questions

1. If the sum of the slopes of the lines given by $4x^2 + 2\lambda xy - 7y^2 = 0$ is equal to the product of the slope, then λ is equal to

A. -4

B. -2

C. 2

D. 4

Answer: B

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2. The equation $3ax^2 + 9xy + (a^2 - 2)y^2 = 0$ represents two perpendicular straight lines for

A. only one value of a

B. for all values of a

C. for only two values of a

D. for no value of a

Answer: C

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3. The image of the pair of lines represented by $ax^2 + 2hxy + by^2 = 0$by the line mirror $y = 0$ is

A. $ax^2 + 2hxy + by^2 = 0$

B. $bx^2 - 2hxy + ay^2 = 0$

C. $bx^2 + 2hxy + ay^2 = 0$

D. $ax^2 - 2hxy + by^2 = 0$

Answer: D

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4. Number of points lying on the line $7x + 4y + 2 = 0$ which is equidistant from the lines $15x^2 + 56xy + 48y^2 = 0$ is

A. 0

B. 1

C. 2

D. 4

Answer: C

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5. Orthocentre of the triangle formed by the lines $xy - 3x - 5y + 15 = 0$ and $3x + 5y = 15$ is

A. (-5,-3)

B. (5,3)

C. (-3,-5)

D. (3,5)

Answer: B

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6. Two of the straight lines given by $3x^3 + 3x^2y - 3xy^2 + dy^3 = 0$ are at right angles , if d equal to

A. -4

B. -3

C. -2

D. -1

Answer: B

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7. Two lines are given by $(x - 2y)^2 + k(x - 2y) = 0$. The value of k, so that the distance between them is 3, is :

A. $\sqrt{5}$

B. $2\sqrt{5}$

C. $3\sqrt{5}$

D. $4\sqrt{5}$

Answer: C

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8. The four straight lines given by the equations $2x^2 + 7xy - 12y^2 = 0$ and $12x^2 + 7xy - 12y^2 - x + 7y - 1 = 0$ lie along the sides of a

A. square

B. rhombus

C. rectangle

D. parallelogram

Answer: A

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9. Distance between the parallel lines $4x^2 + 20xy + 25y^2 + 2x + 5y - 12 = 0$

A. $\frac{3}{\sqrt{29}}$

B. $\frac{5}{\sqrt{29}}$

C. $\frac{7}{\sqrt{29}}$

D. $\frac{9}{\sqrt{29}}$

Answer: C

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10. The point of intersection of the two lines given by $2x^2 - 5xy + 2y^2 - 3x + 3y + 1 = 0$ is

A. (-2,2)

B. (-3,3)

C. (3,3)

D. (2,2)

Answer: C

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11. If $\alpha, \beta > 0$ and $\alpha < \beta$ and $ax^2 + 4\gamma xy + \beta y^2 + 4p(x + y + 1) = 0$ represents a pair of straight lines , then

A. $\alpha \leq p \leq \beta$

B. $p \leq \alpha$

C. $p \leq \alpha$ or $p \geq \beta$

D.

Answer: D

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12. If the equation of the pair of straight lines passing through the point $(1, 1)$, one making an angle θ with the positive direction of the x-axis and the other making the same angle with the positive direction of the y-axis, is $x^2 - (a+2)xy + y^2 + a(x+y-1) = 0, a \neq 2,$ then the value of $\sin 2\theta$ is $a-2$ (b) $a+2$ $2(a+2)$ (d) $\frac{2}{a}$

A. a-2

B. a+2

C. $\frac{2}{(a+2)}$

D. $\frac{2}{a}$

Answer: C

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Exercise More Than One Correct Option Type Questions

1. The equation of image of pair of lines $y = |x - 1|$ with respect to y-axis is :

A. y=|x+1|

B. y=|x-1|+3

C. $x^2 - y^2 + 2x + 1 = 0$

D. $x^2 - y^2 + 2x - 1 = 0$

Answer: A::C

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2. If the equation $ax^2 + by^2 + cx + cy = 0$ represents a pair of straight lines , then

A. a+b=0

B. c=0

C. a+c=0

D. c(a+b)=0

Answer: A::B::D

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3. If $x^2 + \alpha y^2 + 2\beta y = a^2$ represents a pair of perpendicular straight lines , then

A. $\alpha = 1, \beta = a$

B. $\alpha = 1, \beta = -a$

C. $\alpha = -1, \beta = -a$

D. $\alpha = -1, \beta = a$

Answer: C::D

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4. If the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the y-axis then

A. $f^2 = bc$

B. abc=2fgh

C. $bg^2 \neq ch^2$

D. $2fgh = bg^2 + ch^2$

Answer: A::D

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5. Two pair of straight lines have the eqautions $y^2 + xy - 12x^2 = 0$ and $ax^2 + 2hxy + by^2 = 0$. One line will be common among them if

A. a=-3(2h+3b)

B. a=8 (h-2b)

C. a=2(b+h)

D. a=-3(b+h)

Answer: A::B

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6. The three sides of a triangle are given by $\left(x^2-y^2\right)(2x+3y-6)=0.$

If the points (-2,a) lies inside and (b,1) lies outside the triangle, then

A. $2<a<\frac{10}{3}$

B. $-2<a<\frac{10}{3}$

C. $-1<b<\frac{9}{2}$

D. $-1<b<1$

Answer: A::D

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Exercise Passage Based Questions

1. Consider the equation of a pair of straight lines as $x^2 - 3xy + \lambda y^2 + 3x = 5y + 2 = 0$

The value of λ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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2. Consider the equation of a pair of straight lines as $x^2 - 3xy + \lambda y^2 + 3x = 5y + 2 = 0$

The point of intersection of line is (α, β) , then the value of $\alpha^2 + \beta^2$ is

A. 2

B. 5

C. 10

D. 17

Answer: C

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3. Consider the equation of a pair of straight lines as $x^2 - 3xy + \lambda y^2 + 3x = 5y + 2 = 0$

The angle between the lines is θ then the value of cos 2θ is

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

Answer: D

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4. Let $f_1(x, y) \equiv ax^2 + 2hxy + by^2 = 0$ and let $f_{i+1}(x, y) = 0$ denote the equation of the bisectors of $f_i(x, y) = 0$ for all i=1,2,3,.....

$f_3(x, y) = 0 is$

A. $hx^2 - (a - b)xy - hy^2 = 0$

B. $(a - b)x^2 + 4hxy - (a - b)y^2 = 0$

C. $ax^2 + 2hxy + by^2 = 0$

D. None of the above

Answer: B

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5. Let $f_1(x, y) \equiv ax^2 + 2hxy + by^2 = 0$ and let $f_{i+1}(x, y) = 0$ denote the equation of the bisectors of $f_i(x, y) = 0$ for all i=1,2,3,.....

If $f_{i+1}(x, y) = 0$ repersents the equation of a pair of perpendicular lines , then $f_3(x, y) = 0$ is same as

A. $f_1(x, y) = 0$

B. $f_2(x, y) = 0$

C. $hx^2 - (a - b)xy - hy^2 = 0$

D. None of the above

Answer: A

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6. Let $f_1(x, y) \equiv ax^2 + 2hxy + by^2 = 0$ and let $f_{i+1}(x, y) = 0$ denote the equation of the bisectors of $f_i(x, y) = 0$ for all i=1,2,3,.....

The value of $\sum_{n=2}^{5} \frac{f_{n+2}(x, y)}{f_n(x, y)} is$

A. 14

B. 4

C. 54

D. 6

Answer: B

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7. Consider a pair of perpendicular straight lines $2x^2 + 3xy + by^2 - 11x + 13y + c = 0$ The value fo c is

A. -2

B. 2

C. -3

D. 3

Answer: A

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8. Consider a pair of perpendicular straight lines $2x^2 + 3xy + by - 11x + 13y + c = 0$

The value of |b+2c|is

A. 4

B. 6

C. 8

D. 10

Answer: B

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9. Consider a pair of perpendicular straight lines $2x^2 + 3xy + by - 11x + 13y + c = 0$

The value fo c is

A. 2

B. 3

C. 4

D. 5

Answer: C

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Exercise Single Integer Answer Type Questions

1. Equation $\lambda x^3 - 10x^2y - xy^2 + 4y^3 = 0$ represented three straight lines ,out of these three , two makes equal angle with y=x$\lambda < 0$, then the value of λ is

A. Area enclosed by curves $y^2 - 5xy + 6x^2 + 3x - y = 0$ and $y^2 - 5xy + 6x^2 + 2x - y = 0 is \lambda$ sq units , then the value of λ is

B.

C.

D.

Answer: (7)

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2. Area enclosed by curves $y^2 - 5xy + 6x^2 + 3x - y = 0$ and $y^2 - 5xy + 6x^2 + 2x - y = 0$ is λ sq units , then the value of λ is

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3. The lines represented by $x^2 + 2\lambda xy + 2y^2 = 0$ and $(\lambda + 1)x^2 - 8xy + y^2 = 0$ are equally inclined , then the value of $|\lambda|$ is

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4. If the lines joining the origin to the intersection of the line y=nx+2 and the curve $x^2 + y^2 = 1$ are at right angles, then the value of n^2 is

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5. Area of the triangle formed by the line $x + y = 3$ and angle bisectors of the pair of straight lines $x^2 - y^2 + 2y = 1$ is $2sq\grave{u}nits$ b. $4sq\grave{u}nits$ c. $6sq\grave{u}nits$ d. $8sq\grave{u}nits$

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Exercise Statement I And Ii Type Questions

1. Statement I. The four straight lines given by $6x^2 + 5xy - 6y^2 = 0$ and $6x^2 + 5xy - 6y^2 - x + 5y - 1 = 0$ are the sides of a square .

Statement II . The lines represented by general equation of second

degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ are perpendicular if a+b=0 .

A. Statement I is true, Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: b

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2. Statement I. Two of the straight lines represented by $dx^3 + cx^2y + bxy^2 + ay^3 = 0$ will be at right angles if $d^2 + bd + bc + a^2 = 0$

Statement II. Product of the slopes of two perpendicular line is -1

A. Statement I is true, Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: b

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3. Statement I. if $\alpha\beta = -1$ then the pair of straight lines $x^2 - 2\alpha xy - y^2 = 0$ and $y^2 + 2\beta xy - x^2 = 0$ are the angle bisector of each other.

Statement II. Pair of angle bisector lines of the pair of lines $ax^2 + 2hxy + by^2 = 0 ish\left(x^2 - y^2\right) = (a - b)xy.$

A. Statement I is true, Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: a

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4. Statement 1 : If $-h2 = a + b,$ then one line of the pair of lines $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the coordinate axes in the positive quadrant. Statement 2 : If $ax + y(2h + a) = 0$ is a factor of $ax^2 + 2hxy + by^2 = 0,$ then $b + 2h + a = 0$ Both the statements are true but statement 2 is the correct explanation of statement 1. Both the statements are true but statement 2 is not the correct explanation of

statement 1. Statement 1 is true and statement 2 is false. Statement 1 is false and statement 2 is true.

A. Statement I is true, Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: b

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Exercise Subjective Type Questions

1. The straight lines represented by $(y-mx)^2=a^2(1+m^2)$ and $(y-nx)^2=a^2(1+n^2)$ from a rectangle (b) rhombus trapezium (d)

none of these

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2. Prove that the equation m $\left(x^3 - 3xy^2\right) + y^3 - 3x^2y = 0$ represents three straight lines equally inclined to each other.

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3. Show that straight lines $\left(A^2 - 3b^2\right)x^2 + 8ABxy\left(b^2 - 3A^2\right)y^2 = 0$ form with the line $Ax + By + C = 0$ an equilateral triangle of area $\frac{C^2}{\sqrt{3(A^2 + B^2)}}$.

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4. Find the equations of the diagonals of the parallelogram formed by the lines $L^2 - aL = 0$ and $L'^2 - aL' = 0$, where $L = x\cos\theta + y\sin\theta - p$ and $L' = \cos\theta' + y\sin\theta' - p'$

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5. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ and $ax^2 + 2hxy + by^2 - 2gx - 2fy + c = 0$ each represents a pair of lines , then prove that the area of the parallelogram enclosed by them is $\frac{2|c|}{\sqrt{h^2 - ab}}$.

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6. Prove that lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ are equidistant from the origin , if $f^4 - g^4 = c(bf^2 - ag^2)$. Also , find the product of their distances from the origin .

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7. If two of the lines represented by $ax^4 + bx^3y + cx^2y^2 + dxy^3 + ay^4 = 0$ bisects the angle between the other two, then

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Exercise Questions Asked In Previous 13 Years Exam

1. If the pair of lines $ax^2 + 2(a+b)xy + by^2 = 0$ lie along diameters of a circle and divide the circle into four sectors such that the area of one of the sectors is thrice the area of another sector then

A. $3a^2 + 2ab + 3b^2 = 0$

B. $3a^2 + 10ab + 3b^2 = 0$

C. $3a^2 - 2ab + 3b^2 = 0$

D. $3a^2 - 10ab + 3b^2 = 0$

Answer: A

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2. If one of the lines of $my^2 + (1 - m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines $xy = 0$, then m is

A. $-\frac{1}{2}$

B. -2

C. 1

D. 2

Answer: C

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