MATHS

BOOKS - CENGAGE

STRAIGHT LINES

Solved Examples And Exercises

1. If the lines joining the origin and the point of intersection of curves $ax^2 + 2hxy + by^2 + 2gx + 0$ and $a_1x^2 + 2h_1xy + b_1y^2 + 2g_1x = 0$ are mutually perpendicular, then prove that $g(a_1 + b_1) = g_1(a + b)$.

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2. 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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3. If $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ bisect angles between each other, then find the condition.

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4. Find the value of a for which the lines represented by $ax^2 + 5xy + 2y^2 = 0$ are mutually perpendicular.

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5. Find the acute angle between the pair of lines represented by $x(\cos\alpha - y\sin\alpha)^2 = (x^2 + y^2)\sin^2\alpha$

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6. If the angle between the two lines represented by $2x^2 + 5xy + 3y^2 + 6x + 7y + 4 = 0$ is $\tan^{-1}(m)$, then find the value of m.

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7. If the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is rotated about the origin through 90^0 , then find the equations in the new position.

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8. 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

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9. If the slope of one line is double the slope of another line and the combined equation of the pair of lines is $\left(\frac{x^2}{a}\right) + \left(\frac{2xy}{h}\right) + \left(\frac{y^2}{b}\right) = 0$, then find the ratio $ab : h^2$.

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

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11. The value k for which $4x^2 + 8xy + ky^2 = 9$ is the equation of a pair of straight lines is________

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12. The two lines represented by $3ax^2 + 5xy + (a^2 - 2)y^2 = 0$ are perpendicular to each other for (a)two values of a (b) a (c)for one value of

a (d) for no values of a

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13. If two lines represented by $x^4 + x^3y + cx^2y^2 - xy^3 + y^4 = 0$ bisect the angle between the other two, then the value of c is (a) 0 (b) -1 (c) 1 (d) -6

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14. 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)1 (b) 2 (c) $-\frac{1}{2}$ (d) -1

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15. 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.

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16. Show that all chords of the curve $3x^2-y^2-2x+4y=0,$ which subtend a right angle at the origin, pass through a fixed point. Find the coordinates of the point.

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17. Area of the triangle formed by the lines $y^2-9xy+18x^2=0 and y=6$ is___

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18. The distance between the lines $(x+7y)^2+4\sqrt{2}(x+7y)-42=0$ is___________

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19. $x+y=7$ and $ax^2+2hxy+ay^2=0, (a\neq 0)$, are three real distinct lines forming a triangle. Then the triangle is (a) isosceles (b) scalene (c) equilateral (d) right angled

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20. If the slope of one of the lines represented by $ax^2+2hxy+by^2=0$ is the square of the other, then $\frac{a+b}{h}+\frac{8h^2}{ab}=$ (a) 4 (b) 6 (c) 8 (d) none of these

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21. Find the area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pair of lines $x^2 - y^2 + 4y - 4 = 0$

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22. The sides of a triangle have the combined equation $x^2 - 3y^2 - 2xy + 8y - 4 = 0$. The third side, which is variable, always passes through the point $(-5, -1)$. Find the range of values of the slope of the third line such that the origin is an interior point of the triangle.

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23. Let PQR be a right-angled isosceles triangle, right angled at $P(2, 1)$. If the equation of the line QR is $2x + y = 3$, then the equation representing the pair of lines PQ and PR is (a) $3x^2 - 3y^2 + 8xy + 20x + 10y + 25 = 0$ (b) $3x^2 - 3y^2 + 8xy - 20x - 10y + 25 = 0$ (c)

$3x^2 - 3y^2 + 8xy + 10x + 15y + 20 = 0$ (d)

$3x^2 - 3y^2 - 8xy - 15y - 20 = 0$

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24. Find the equation of the bisectors of the angles between the lines joining the origin to the point of intersection of the straight line $x - y = 2$ with the curve $5x^2 + 11xy = 8y^2 + 8x - 4y + 12 = 0$

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25. If θ is the angle between the lines given by the equation $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$, then find the equation of the line passing through the point of intersection of these lines and making an angle θ with the positive x-axis.

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26. The distance of a point (x_1, y_1) from two straight lines which pass through the origin of coordinates is p. Find the combined equation of these straight lines.

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27. Prove that the product of the perpendiculars from (α, β) to the pair of lines $ax^2 + 2hxy + by^2 = 0$ is $\dfrac{a\alpha^2 - 2h\alpha\beta + \boldsymbol{\eta}^2}{\sqrt{(a-b)^2 + 4h^2}}$

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28. Find the area enclosed by the graph of $x^2y^2 = 9x^2 - 25y^2 + 225 = 0$

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29. Show that the pairs of straight lines $2x^2 + 6xy + y^2 = 0$ and $4x^2 + 18xy + y^2 = 0$ have the same set of angular bisector.

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30. 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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31. Find the angle between the straight lines joining the origin to the point of intersection of $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y = 1$

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32. Through a point A on the x-axis, a straight line is drawn parallel to the y-axis so as to meet the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ at B and C. If $AB = BC,$ then (a)$h^2 = 4ab$ (b) $8h^2 = 9ab$ (c)$9h^2 = 8ab$ (d) $4h^2 = ab$

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33. Find the lines whose combined equation is $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$

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34. Does equation $x^2 + 2y^2 - 2\sqrt{3}x - 4y + 5 = 0$ satisfies the condition $abc + 2gh - af^2 - bg^2 - ch^2 = 0$? Does it represent a pair of straight lines?

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35. Find the value of λ if $2x^2 + 7xy + 3y^2 + 8x + 14t + \lambda = 0$ represents a pair of straight lines

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36. The distance between the pair of parallel lines $x^2 + 4xy + 4y^2 + 3x + 6y - 4 = 0$ is

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37. If the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the y-axis, then prove that $2fgh = bg^2 + ch^2$

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38. Find the lines whose combined equation is $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$

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39. If the component lines whose combined equation is $px^2 - qxy - y^2 = 0$ make the angles α and β with x-axis , then find the value of tan $(\alpha + \beta)$.

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40. Find the joint equation of the pair of lines which pass through the origin and are perpendicular to the lines represented the equation $y^2 + 3xy - 6x + 5y - 14 = 0$

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

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42. If the gradient of one of the lines $x^2 + hxy + 2y^2 = 0$ is twice that of the other, then $h =$

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43. 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)1 (b) 2 (c) $-\frac{1}{2}$ (d) -1

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44. Two pairs of straight lines have the equations $y^2 + xy - 12x^2 = 0$ and $ax^2 + 2hxy + by^2 = 0$. One line will be common among them if. $a + 8h - 16b = 0$ (b) $a - 8h + 16b = 0$ $a - 6h + 9b = 0$ (d) $a + 6h + 9b = 0$

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45. 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)$a - 2$

(b) $a+2$

(c) $\frac{2}{a+2}$

(d) $\frac{2}{a}$

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46. If one of the lines given by the equation $2x^2+pxy+3y^2=0$ coincide with one of those given by $2x^2+qxy-3y^2=0$ and the other lines represented by them are perpendicular, then $p=5$ (b) $p=-5$ $q=-1$ (d) $q=1$

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47. If $x^2+2hxy+y^2=0$ represents the equation of the straight lines through the origin which make an angle α with the straight line $y+x=0$

(a) $sec2\alpha=h$

(b) $\cos\alpha=\sqrt{\frac{(1+h)}{(2h)}}$

(c) $2\sin\alpha = \sqrt{\frac{(1+h)}{h}}$

(d) $\cot\alpha = \sqrt{\frac{(1+h)}{(h-1)}}$

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48. The equation to a pair of opposite sides of a parallelogram are $x^2 - 5x + 6 = 0$ and $y^2 - 6y + 5 = 0$. The equations to its diagonals are (a) $x + 4y = 13, y = 4x - 7$ (b) $4x + y = 13, 4y = x - 7$ (c) $4x + y = 13, y = 4x - 7$ (d) $y - 4x = 13, y + 4x - 7$

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

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50. Area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pairs of straight lines $x^2 - y^2 + 2y = 1$ is

(a)$2squnits$

(b)$4squnits$

(c)$6squnits$

(d)$8squnits$

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51. The equation $x^2y^2 - 9y^2 - 6x^2y + 54y = 0$ represents (a) a pair of straight lines and a circle (b) a pair of straight lines and a parabola (c) a set of four straight lines forming a square (d) none of these

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52. The straight lines represented by $(y - mx)^2 = a^2(1 + m^2)$ and $(y - nx)^2 = a^2(1 + n^2)$ from a (a) rectangle (b) rhombus (c) trapezium (d) none of these

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53. The condition that one of the straight lines given by the equation $ax^2 + 2hxy + by^2 = 0$ may coincide with one of those given by the equation $a'x^2 + 2h'xy + b'y^2 = 0$ is

$(ab' - a'b)^2 = 4(ha' - h'a)(bh' - b'h)$

$(ab' - a'b)^2 = (ha' - h'a)(bh' - b'h)$

$(ha' - h'a)^2 = 4(ab' - a'b)(bh' - b'h)$

$(bh' - b'h)^2 = 4(ab' - a'b)(ha' - h'a)$

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54. The angle between the pair of lines whose equation is $4x^2 + 10xy + my^2 + 5x + 10y = 0$ is (a) $\tan^{-1}\left(\frac{3}{8}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$ (c) $\tan^{-1}\left\{2\frac{\sqrt{25 - 4m}}{m + 4}\right\}, m \in R$ (d) none of these

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55. Find the point of intersection of the pair of straight lines represented by the equation $6x^2 + 5xy - 21y^2 + 13x + 38y - 5 = 0$.

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56. Find the angle between the lines represented by $x^2 + 2xy\sec\theta + y^2 = 0$

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57. 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.

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58. If the equation $2x^2 + kxy + 2y^2 = 0$ represents a pair of real and distinct lines, then find the values of k.

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59. If the equation $x^2 + (\lambda + \mu)xy + \lambda uy^2 + x + \mu y = 0$ represents two parallel straight lines, then prove that $\lambda = \mu$.

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60. If one of the lines of the pair $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the positive direction of the axes. Then find the relation for a, b, h

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61. Prove that the equation $2x^2 + 5xy + 3y^2 + 6x + 7y + 4 = 0$ represents a pair of straight lines. Find the coordinates of their point of intersection and also the angle between them.

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62. A line L passing through the point (2, 1) intersects the curve $4x^2 + y^2 - x + 4y - 2 = 0$ at the point $AandB$. If the lines joining the origin and the points A, B are such that the coordinate axes are the bisectors between them, then find the equation of line L.

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63. If (-2,6) is the image of the point (4,2) with respect to line L=0, then L is:

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64. Find the equation of the line which satisfy the given conditions : Perpendicular distance from the origin is 5 units and the angle made by the perpendicular with the positive xaxis is 30° .

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65. The number of integral values of m for which the x-coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer is (a)2 (b) 0 (c) 4 (d) 1

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66. Reduce the line $2x - 3y + 5 = 0$ in slope-intercept, intercept, and normal forms.

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67. The line 5x + 4y = 0 passes through the point of intersection of straight lines (1) x+2y-10 = 0, 2x + y =-5

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68. If the intercept of a line between the coordinate axes is divided by the point $(-5, 4)$ in the ratio $1:2$, then find the equation of the line.

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69. Show that the lines $2x+3y+19=0$ and $9x+6y-17=0$, cut the coordinate axes at concyclic points.

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70. The straight lines $3x+y-4=0, x+3y-4=0$ and $x+y-4=0$ form a triangle which is :

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71. If $P = (1, 0); Q = (-1, 0) \& R = (2, 0)$ are three given points, then the locus of the points S satisfying the relation, $SQ^2 + SR^2 = 2SP^2$ is - (a)a straight line parallel to x-axis (b) A circle through origin (c) A circle with center at the origin (d)a straight line parallel to y-axis

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72. Distance of point $(2, 3)$ from the line $2x - 3y + 9 = 0$ along $x - y + 1 = 0$

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73. A rectangle $ABCD$ has its side AB parallel to line $y = x$, and vertices $A, BandD$ lie on $y = 1, x = 2,$ and $x = -2,$ respectively. The locus of vertex C is (a)$x = 5$ (b) $x - y = 5$ (c)$y = 5$ (d) $x + y = 5$

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74. The equation of a line through the point (1, 2) whose distance from the point $(3, 1)$ has the greatest value is (a)$y = 2x$ (b) $y = x + 1$ (c) $x + 2y = 5$ (d) $y = 3x - 1$

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75. Find the equation of the line through the point $A(2, 3)$ and making an angle an angle of 45^0 with the $x - axis$. Also, determine the length of intercept on it between $Aand$ the line $x + y + 1 = 0$.

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76. The line joining two points A(2,0) and B(3,1) is rotated about A in anticlockwise direction through an angle of 15°. find the equation of line in the new position. If b goes to c in the new position what will be the coordinates of C.

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77. The area of the triangle formed by the lines $y = ax, x + y - a = 0$, and the y-axis to (a) $\frac{1}{2|1+a|}$ (b) $\frac{1}{|1+a|}$ (c) $\frac{1}{2}\left|\frac{a}{1+a}\right|$ (d) $\frac{a^2}{2|1+a|}$

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78. The equations of the lines through the point (3, 2) which makes an angle of 45° with the line x - 2y = 3 are

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79. Consider the points A(0,1) and B(2,0), and P be a point on the line 4x+3y+9=0. The coordinates of P such that |PA-PB| is maximum are

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80. The perpendicular from the origin to a line meets it at the point $(-2, 9)$ find the equation of the line.

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81. Find the direction in which a straight line must be drawn through the point $(-1, 2)$ so that its point of intersection with the line $x+y=4$ may be at a distance of 3 units from this point.

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82. Two fixed points A and B are taken on the coordinates axes such that OA=a and OB =b. Two variable points A' and B' are taken on the same axes such that OA'+OB' = OA+OB. Find the locus of the point of intersection of AB' and A'B.

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83. Find the equations of the lines, which cut-off intercepts on the axes whose sum and product are 1 and -6, respectively.

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84. Find the equation of the straight line which passes through the origin and makes angle 60° with the line $x+\sqrt{3}y+3$

$\sqrt{3}=0$

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85. The equation of a straight line passing through the point (2,3) and inclined at an angle of $\tan^{-1}(1/2)$ with the line y+2x=5 is

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86. If we reduce $3x+3y+7=0$ to the form $x\cos\alpha+y\sin\alpha=p$, then find the value of p.

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87. The equation of lines on which the perpendiculars from the origin make 30^0 angle with the x-axis and which form a triangle of area $\frac{50}{\sqrt{3}}$ with the axes are (a) $\sqrt{3}x + y - 10 = 0$ (b) $\sqrt{3}x + y + 10 = 0$ (c) $x + \sqrt{3}y - 10 = 0$ (d) $x - \sqrt{3}y - 10 = 0$

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88. A line intersects the straight lines $5x - y - 4 = 0$ and $3x - 4y - 4 = 0$ at A and B , respectively. If a point $P(1, 5)$ on the line AB is such that $AP : PB = 2 : 1$ (internally), find point $A\cdot$

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89. A line is a drawn from $P(4, 3)$ to meet the lines L_1 and l_2 given by $3x + 4y + 5 = 0$ and $3x + 4y + 15 = 0$ at points A and B

respectively. From A , a line perpendicular to L is drawn meeting the line L_2 at A_1 Similarly, from point B_1 Thus a parallelogram $\forall_1 BB_1$ is formed. Then the equation of L so that the area of the parallelogram $\forall_1 BB_1$ is the least is (a) $x-7y+17=0$ (b) $7x+y+31=0$ (c) $x-7y-17=0$ (d) $x+7y-31=0$

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90. Two straight lines $u=0 and v=0$ pass through the origin and the angle between them is $\tan^{-1}\left(\frac{7}{9}\right)$. If the ratio of the slope of $v=0$ and $u=0$ is $\frac{9}{2}$, then their equations are (a) $y+3x=0 and 3y+2x=0$ (b) $2y-3x=0 and 3y-x=0$ (c)$2y=3x and 3y=x$ (d) $y=3x and 3y=2x$

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91. A straight line through the point (2, 2) intersects the lines $\sqrt{3}x+y=0$ and $\sqrt{3}x-y=0$ at the points A and B. The equation of

AB so that the triangle OAB is equilateral, where O is the origin.

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92. Let $u \equiv ax + by + a^3\sqrt{b} = 0, v \equiv bx - ay + b^3\sqrt{a} = 0, a, b \in R,$ be two straight lines. The equations fo the bisectors of the angle formed by $k_1 u - k_{2_v = 0 \text{ and } k_1 u + k_2 v = 0}$, for nonzero and real k_1 and k_2, are

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93. A line which makes an acute angle θ with the positive direction of the x-axis is drawn through the point $P(3, 4)$ to meet the line $x = 6$ at R and $y = 8$ at S. Then, (a) $PR = 3\sec\theta$ (b)$PS = 4\cos ec\theta$ (c) $PR = +PS = \left(2\frac{3\sin\theta + 4\cos\theta}{\sin 2\theta}\right)$ (d)$\frac{9}{(PR)^2} + \frac{16}{(PS)^2} = 1$

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94. Find the values of non-negative real number $h_1, h_2, h_3, k_1, k_2, k_3$ such that the algebraic sum of the perpendiculars drawn from the points $(2, k_1), (3, k_2), *7, k_3), (h_1, 4), (h_2, 5), (h_3, -3)$ on a variable line passing through (2, 1) is zero.

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95. The sides of a triangle ABC lie on the lines 3x+4y = 0, 4x+3y=0, and x=3. Let (h,k) be the center of the circle inscribed in ΔABC. The value of (h+k) equals.

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96. If a and b are two arbitray constants, then prove that the straight line (a-2b)x+(a+3b)y+3a+4b=0 will pass through a fixed. Find that point.

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97. If the two sides of rhombus are x+2y+2=0 and 2x+y-3=0, then find the slope of the longer diagonal.

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98. The lines $x+y-1=0, (m-1)x+\left(m^2-7\right)y-5=0,$ and $(m-2)x+(2m-5)y=0$ are (a)concurrent for three values of m (b)concurrent for one value of m (c)concurrent for no value of m (d)parallel for $m=3$.

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99. In triangle ABC, the equation of the right bisectors of the sides AB and AC are x+y=0 and y-x=0. respectively.

If $A\equiv(5,7)$ the find the equation of side BC.

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100. Show that the straight lines given by $x(a+2b)+y(a+3b)=a$ for different values of $a and b$ pass through a fixed point.

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101. The straight line $3x+4y-12=0$ meets the coordinate axes at $A and B$. An equilateral triangle ABC is constructed. The possible coordinates of vertex C (a) $\left(2\left(1-\frac{3\sqrt{3}}{4}\right), \frac{3}{2}\left(1-\frac{4}{\sqrt{3}}\right)\right)$ (b) $\left(-2(1+\sqrt{3}), \frac{3}{2}(1-\sqrt{3})\right)$ (c) $\left(2(1+\sqrt{3}), \frac{3}{2}(1+\sqrt{3})\right)$ (d) $\left(2\left(1+\frac{3\sqrt{3}}{4}\right), \frac{3}{2}\left(1+\frac{4}{\sqrt{3}}\right)\right)$

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102. Let $ax+by+c=0$ be a variable straight line, where $a, b and c$ are the 1st, 3rd, and 7th terms of an increasing AP, respectively. Then prove that the variable straight line always passes through a fixed point. Find that point.

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103. Prove that all the having sum of the intercepts on the axes equal to half of the product of the intercepts pass through a fixed point. Also, find that fixed point.

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104. Given three straight lines $2x+11y-5=0$, $24x+7y-20 = 0$, and $4x-3y-2=0$. Then,

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105. Find the straight line passing through the point of intersection of lines $2x+3y+5=0$ and $5x-2y-16=0$ and through the point $(-1,3)$ using the concept of family of lines.

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106. The lines $x+2y+3=0, x+2y-7=0, and 2x-y-4=0$ are the sides of a square. The equation of the remaining side of the square can be (a) $2x-y+6=0$ (b) $2x-y+8=0$ (c) $2x-y-10=0$ (d) $2x-y-14=0$

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107. Consider a family of straight lines $(x+y)+\lambda(2x-y+1)=0$. Find the equation of the straight line belonging to this family that is farthest from $(1,-3)$.

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108. The equation of straight line belonging to both the families of lines $(x-y+1)+\lambda_1(2x-y-2)=0$ and $(5x+3y-2)+\lambda_2(3x-y-4)=0$ where λ_1, λ_2 are arbitrary numbers is (A) $5x-2y-7=0$ (B)$2x+5y-7=0$ (C) $5x+2y-7=0$ (D) $2x-5y-7=0$

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109. If the algebraic sum of the distances of a variable line from the points $(2, 0), (0, 2)$, and $(-2, -2)$ is zero, then the line passes through the fixed point. (a)$(-1, -1)$ (b) $(0, 0)$ (c)$(1, 1)$ (d) $(2, 2)$

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110. If the points $\left(\frac{a^3}{(a-1)}\right), \left(\frac{(a^2-3)}{(a-1)}\right), \left(\frac{b^3}{b-1}\right), \left(\frac{b^2-3}{(b-1)}\right), \left(\frac{c^3}{c-1}\right)$ and $\left(\frac{(c^2-3)}{(c-1)}\right)$, where a, b, c are different from 1, lie on the $lx+my+n=0$, then (a) $a+b+c=-\frac{m}{l}$ (b)$ab+bc+ca=\frac{n}{l}$ (c) $abc=\frac{(m+n)}{l}$ (d)$abc-(bc+ca+ab)+3(a+b+c)=0$

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111. If a, b, c are in harmonic progression, then the straight line $\left(\left(\frac{x}{a}\right)\right) + \left(\frac{y}{b}\right) + \left(\frac{1}{c}\right) = 0$ always passes through a fixed point. Find that point.

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112. Prove that the area of the parallelogram contained by the lines $4y - 3x - a = 0, 3y - 4x + a = 0, 4y - 3x + 3a = 0,$ and $3y - 4x + 2a = 0$ is $\left(\frac{2}{7}\right)a^2.$

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113. Let ABC be a given isosceles triangle with AB=AC. Sides AB and AC are extended up to E and F, repectively, such that $BE \times CF = AB^2$. Prove that the line EF always passes through a fixed point.

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114. Find the points on y-axis whose perpendicular distance from the line $4x - 3y - 12 = 0$ is 3.

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115. Find all the values of θ for which the point $(\sin^2\theta, \sin\theta)$ lies inside the square formed by the line $xy = 0$ and $4xy - 2x - 2y + 1 = 0$.

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116. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos 2\theta$ and $x\sec\theta + y\cos ec\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$.

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117. The equations of two sides of a triangle are 3y-x-2=0 and y+x-2=0. The third side, which is variable, always passes through the point (5,-1). Find the range of the values of the slope of the third side, so that the origin is an interior point of the triangle.

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118. Prove that the lengths of the perpendiculars from the points $(m^2, 2m)$, $(mm', m+m')$, and $(m'^2, 2m')$ to the line $x+y+1=0$ are in GP.

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119. Find the equations of lines parallel to $3x-4y-5=0$ at a unit distance from it.

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120. Find the equation of a straight line passing through the point $(-5, 4)$ and which cuts off an intercept of $\sqrt{2}$ units between the lines $x + y + 1 = 0$ and $x + y - 1 = 0$.

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121. Are the points $(3, 4)$ and $(2, -6)$ on the same or opposite sides of the line $3x - 4y = 8$?

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122. Consider the equation $y - y_1 = m(x - x_1)$. If $m and x_1$ are fixed and different lines are drawn for different values of y_1, then (a)the lines will pass through a fixed point (b)there will be a set of parallel lines (c)all the lines intersect the line $x = x_1$ (d)all the lines will be parallel to the line $y = x_1$

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123. In a triangle ABC, side AB has equation $2x + 3y = 29$ and side AC has equation $x + 2y = 16$. If the midpoint of BC is (5, 6), then find the equation of BC.

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124. The foot of the perpendicular on the line $3x + y = \lambda$ drawn from the origin is C. If the line cuts the x and the y-axis at $AandB$, respectively, then $BC : CA$ is

(a)$1 : 3$

(b) $3 : 1$

(c) $1 : 9$

(d) $9 : 1$

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125. If the two consecutive sides of a parallelogram are $4x + 5y = 0$ and $7x + 2y = 0$. If the equation of one diagonal is $11x + 7y = 9$, find the equation of the other diagonal.

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126. The real value of a for which the value of m satisfying the equation $(a^2-1)m^2-(2a-3)m+a=0$ given the slope of a line parallel to the y-axis is (a) $\frac{3}{2}$ (b) 0 (c) 1 (d) ± 1

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127. If one of the sides of a square is $3x-4y-12=0$ and the center is $(0,0)$, then find the equations of the diagonals of the square.

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128. If the quadrilateral formed by the lines $ax+by+c=0, a'x+b'y+c=0, ax+by+c'=0, a'x+b'y+c'=$

has perpendicular diagonals, then (a) $b^2+c^2=b'^2+c'^2$ (b) $c^2+a^2=c'^2+a'^2$ (c)$a^2+b^2=a'^2+b'^2$ (d) none of these

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129. The vertex P of an equilateral triangle $\triangle PQR$ is at $(2, 3)$ and the equation of the opposite side QR is given by $x+y=2$. Find the possible equations of the side PQ.

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130. The straight lines $7x-2y+10=0$ and $7x+2y-10=0$ form an isosceles triangle with the line $y=2$. The area of this triangle is equal to (a)$\frac{15}{7} squnits$ (b) $\frac{10}{7} squnits$ (c)$\frac{18}{7} squnits$ (d) none of these

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131. Find the least value of $(x-2)^2+(y-2)^2$ under the condition $3x+4y-2=0.$

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132. θ_1 and θ_2 are the inclination of lines $L_1 and L_2$ with the x-axis. If $L_1 and L_2$ pass through $P(x_1, y_1)$, then the equation of one of the angle bisector of these lines is (a) $\frac{x-x_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}=\frac{y-y_1}{\sin\left(\frac{\theta_1+\theta_2}{2}\right)}$ (b) $\frac{x-x_1}{-\sin\left(\frac{\theta_1+\theta_2}{2}\right)}=\frac{y-y_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}$ (c) $\frac{x-x_1}{\sin\left(\frac{\theta_1+\theta_2}{2}\right)}=\frac{y-y_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}$ (d) $\frac{x-x_1}{-\sin\left(\frac{\theta_1+\theta_2}{2}\right)}=\frac{y-y_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}$

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133. Find the least and greatest values of the distance of the point $(\cos\theta, \sin\theta), \theta \in R,$ from the line $3x-4y+10=0.$

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134. A light ray coming along the line $3x + 4y = 5$ gets reflected from the line $ax + by = 1$ and goes along the line $5x - 12y = 10$. Then, (A) $a = \frac{64}{115}, b = \frac{112}{15}$ (B) $a = \frac{14}{15}, b = -\frac{8}{115}$ (C) $a = \frac{64}{115}, b = -\frac{8}{115}$ (D) $a = \frac{64}{15}, b = \frac{14}{15}$

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135. Line $ax + by + p = 0$ makes angle $\frac{\pi}{4}$ with $x\cos\alpha + y\sin\alpha = p, p \in R^{+}$. If these lines and the line $x\sin\alpha - y\cos\alpha = 0$ are concurrent, then (a)$a^2 + b^2 = 1$ (b) $a^2 + b^2 = 2$ (c)$2(a^2 + b^2) = 1$ (d) none of these

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136. Two sides of a square lie on the lines $x + y = 1 and x + y + 2 = 0.$

What is its area?

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137. A line is drawn perpendicular to line $y = 5x$, meeting the coordinate axes at $AandB$. If the area of triangle OAB is 10 sq. units, where O is the origin, then the equation of drawn line is (a)$3x - y - 9$ (b) $5y + x = 10$ (c)$5y + x = -10$ (d) $x - 4y = 10$

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138. Find the coordinates of a point on $x + y + 3 = 0$, whose distance from $x + 2y + 2 = 0$ is $\sqrt{5}$.

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139. If $x - 2y + 4 = 0$ and $2x + y - 5 = 0$ are the sides of an isosceles triangle having area $10squnits$, the equation of the third side is (a) $3x - y = -9$ (b) $3x - y + 11 = 0$ (c) $x - 3y = 19$ (d) $3x - y + 15 = 0$

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140. If p is length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

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141. The number of values of a for which the lines $2x + y - 1 = 0$, $ax + 3y - 3 = 0,$ and $3x + 2y - 2 = 0$ are concurrent is 0 (b) 1 (c) 2 (d) infinite

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142. The centre of a square is at the origin and one vertex is A(2,1). Find the coordinates of other vertices of the square.

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143. $ABCD$ is a square $A \equiv (1, 2), B \equiv (3, -4)$. If line CD passes through $(3, 8)$, then the midpoint of CD is

A. (a) $(2, 6)$

B. (b) $(6, 2)$

C. (c) $(2, 5)$

D. (d) $\left(\frac{28}{5}, \frac{1}{5}\right)$

Answer: null

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144. Find the distance between $A(2, 3)$ on the line of gradient 3/4 and the point of intersection P of this line with $5x + 7y + 40 = 0$.

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145. The equation of the straight line which passes through the point $(-4, 3)$ such that the portion of the line between the axes is divided internally be the point in the ratio $5:3$ is (A)$9x - 20y + 96 = 0$ (B) $9x + 20y = 24$ (C) $20x + 9y + 53 = 0$ (D) None of these

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146. The equation of the bisector of the acute angle between the lines $2x - y + 4 = 0$ and $x - 2y = 1$ is (a) $x - y + 5 = 0$ (b)$x - y + 1 = 0$ (c)$x - y = 5$ (d) none of these

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147. Find equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0.$

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148. If the equations $y = mx + c$ and $x\cos\alpha + y\sin\alpha = p$ represent the same straight line, then (a)$p = c\sqrt{1+m^2}$ (b) $c = p\sqrt{1+m^2}$ (c) $cp = \sqrt{1+m^2}$ (d) $p^2 + c^2 + m^2 = 1$

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149. Find the equation of the line through $(2, 3)$ which is (i) parallel to the x-axis and (ii) parallel to the y-axis.

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150. Consider three lines as follows. $L_1 : 5x - y + 4 = 0$ $L_2 : 3x - y + 5 = 0$ $L_3 : x + y + 8 = 0$ If these lines enclose a triangle ABC and the sum of the squares of the tangent to the interior angles can be expressed in the form $\frac{p}{q}$, where $pandq$ are relatively prime numbers, then the value of $p + q$ is (a) 500 (b) 450 (c) 230 (d) 465

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151. Find the equation of a straight line cutting off an intercept-1 from the y-axis and being equally inclined to the axes.

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152. The line $L_1 \equiv 4x + 3y - 12 = 0$ intersects the x-and y-axies at A and B, respectively. A variable line perpendicular to L_1 intersects the x- and the y-axis at P and Q , respectively. Then the locus of the circumcenter of triangle ABQ is (a) $3x - 4y + 2 = 0$ (b) $4x + 3y + 7 = 0$ (c) $6x - 8y + 7 = 0$ (d) none of these

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153. Intersecting the y-axis at a distance of 2 units above the origin and making an angle of 30° with positive direction of the x-axis.

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154. Find the locus of the point at which two given portions of the straight line subtend equal angle.

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155. Find the equation of the perpendicular bisector of the line segment joining the points A(2, 3) and B(6, -5).

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156. If on a given base BC, a triangle is described such that the sum of the tangents of the base angles is m, then prove that the locus of the opposite vertex A is a parabola.

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157. Find the equation of a line that has -y-intercept 4 and is a perpendicular to the line joining $(2, -3)$ and $(4, 2)$.

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158. Find the equations of the diagonals of the square formed by the lines $x = o, y = 0, x = 1 and y = 1.$

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159. Find the equation of the straight line that passes through the point $(3, 4)$ and is perpendicular to the line $3x + 2y + 5 = 0$

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160. Find the equation of the line which is parallel to $3x - 2y + 5 = 0$ and passes through the point $(5, -6)$

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161. Consider two lines $L_1 and L_2$ given by $a_1x + b_1y + c_1 = 0 and a_2x + b_2y + c_2 = 0 respectively where c1$ and $c2 \neq$ intersecting at point $P\dot{A}$ line L_3 is drawn through the origin meeting the lines $L_1 and L_2$ at $A and B$, respectively, such that $PA = PB$. Similarly, one more line L_4 is drawn through the origin meeting the lines $L_1 and L_2$ at $A_1 and B_2$, respectively, such that $PA_1 = PB_1$. Obtain the combined equation of lines $L_3 and L_4$.

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162. Find the locus of point P which moves such that its distance from the line $y = \sqrt{3}x - 7$ is the same as its distance from $(2\sqrt{3}, -1)$

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163. Find the coordinate of a point P on the line segment joinig A(1,2) and B(6,7) in such a way that $AP = \frac{2}{5}$ AB.

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164. In what ratio does the line joining the points $(2, 3)$ and $(4, 1)$ divide the segment joining the points $(1, 2)$ and $(4, 3)$?

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165. Show that the lines 4x+y-9=0, x-2y+3=0, 5x-y-6=0 make equal intercepts on any line of slope 2

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166. Find the equation of the bisector of the obtuse angle between the lines $3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0$.

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167. A line through $A(-5, -4)$ meets the lines $x+3y+2=0, 2x+y+4=0 and x-y-5=0$ at the points $B, C and D$ rspectively, if $\left(\frac{15}{AB}\right)^2+\left(\frac{10}{AC}\right)^2=\left(\frac{6}{AD}\right)^2$ find the equation of the line.

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168. The incident ray is along the line $3x-4y-3=0$ and the reflected ray is along the line $24x+7y+5=0$. Find the equation of mirrors.

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169. If the line $yl=\sqrt{3}x$ cuts the curve $x^3+y^3+3xy+5x^2+3y^2+4x+5y-1=0$ at the point A, B, C, then $OA\dot{O}B\dot{O}C$ is equal to $\left(\frac{k}{13}\right)(3\sqrt{3}-1)$. The value of k is_____

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170. Two equal sides of an isosceles triangle are 7x-y+3=0 and x+y-3=0. Its third side passes the point (1,-10).

Determine the equation of the third side.

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171. The area of a parallelogram formed by the lines $ax \pm bx \pm c = 0$ is

(a) $\frac{c^2}{(ab)}$ (b) $\frac{sc^2}{(ab)}$ (c) $\frac{c^2}{2ab}$ (d) none of these

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172. The vertices $BandC$ of a triangle ABC lie on the lines $3y = 4xandy = 0$, respectively, and the side BC passes through the point $\left(\frac{2}{3}, \frac{2}{3}\right)$. If $ABOC$ is a rhombus lying in the first quadrant, O being the origin, find the equation of the line $BC \cdot$

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173. If each of the points (x,, 4), (-2, y,) lie on the-line joining the points (2, -1) and (5,-3) then the point P(x_1, y_1) lies on the line

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174. If the lines $a_1x + b_1y + 1 = 0,\ a_2x + b_2y + 1 = 0\ and\ a_3x + b_3y + 1 = 0$ are concurrent, show that the points $(a_1, b_1),\ (a_2, b_2) and\ (a_3, b_3)$ are collinear.

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175. The diagonals of a parallelogram PQRS are along the lines x+3y =4 and 6x-2y = 7, Then PQRS must be :

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176. For the straight lines 4x+3y-6 = 0 and 5x+12y+9 = 0, find the equation of the:

(i) bisector of the abtuse angle between them

(ii) bisector of the acute angle between them

(iii) bisector of the angle which contains (1,2)

(iv) bisector of the angle which contains (0,0)

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177. A straight line segment of length/moves with its ends on two mutually perpendicular lines. Find the locus of the point which divides the line segment in the ratio 1:2

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178. Find the foot of the perpendicular from the point $(2, 4)$ upon $x + y = 1.$

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179. The lines $x+y-1=0, (m-1)x+\left(m^2-7\right)y-5=0,$ and $(m-2)x+(2m-5)y=0$ are concurrent for three values of m concurrent for no value of m parallel for one value of m parallel for two value of m

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180. In ΔABC , vertex A is (1,2). If the internal angle bisector of $\angle B$ is 2x-y+10=0 and the perpendicular bisector of AC is y=x, then find the equation of BC.

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181. The equation of the line which bisects the obtuse angle between the line $x-2y+4=0$ and $4x-3y+2=0$ is

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182. The line ax+by=1 passes through the point of intertsection of y=x tan $\alpha + p \sec \alpha$ and $y\sin(30^\circ - \alpha) - x\cos(30^\circ - \alpha) = p$. If it is inclined at 30° with $y = (\tan\alpha)x$, then prove that $a^2 + b^2 = \frac{3}{4p^2}$.

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183. A straight line L is perpendicular to the line $5x - y = 1$. The area of the triangle formed by line L, and the coordinate axes is 5. Find the equation of line L.

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184. Find the image of the point $(4, -13)$ in the line $5x + y + 6 = 0$.

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185. Triangle ABC with $AB = 13, BC = 5,$ and $AC = 12$ slides on the coordinates axes with $AandB$ on the positive x-axis and positive y-axis respectively. The locus of vertex C is a line $12x - ky = 0.$ Then the value of k is__________

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186. In a plane there two families of lines : y=x+r, y=-x+r, where $r \in \{0, 1, 2, 3, 4\}.$ The number of the squares of the diagonal of length 2 formed by these lines is___.

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187. Line $\frac{x}{a} + \frac{y}{b} = 1$ cuts the co-ordinate axes at A(a,0) and B(0,b) and the line $\frac{x}{a}' + \frac{y}{b}' = -1$ at $A'(-a', 0)$ and $B'(0, -b')$. If the points A,B,A',B' are concyclic then the orthocentre of triangle ABA' is

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188. If P is a point (x, y) on the line $y = -3x$ such that P and the point (3, 4) are on the opposite sides of the line $3x - 4y = 8$, then

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189. The points (1, 3) and (5, 1) are two opposite vert of a rectangle. The other two vertices lie on the line find the $y = 2x + c$. Find c and the remaining vertices.

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190. The ends A and B of a straight line segment of constant length c slide upon the fixed rectangular axes OX and OY, respectively. If the rectangle OAPB be completed, then the locus of the foot of the perpendicular drawn from P to AB is

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191. All points lying inside the triangle formed by the points (1, 3), (5,0) and (-1, 2) satisfy

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192. The equation to the straight line passing through the point $\left(a\cos^3\theta, a\sin^3\theta\right)$ and perpendicular to the line $x\sec\theta + y\cos ec\theta = a$ is (A) $x\cos\theta - y\sin\theta = a\cos 2\theta$ (B) $x\cos\theta + y\sin\theta = a\cos 2\theta$ (C) $x\sin\theta + y\cos\theta = a\cos 2\theta$ (D) none of these

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193. The equation of a straight line on which the length of perpendicular from the origin is four units and the line makes an angle of 120^0 with the x-axis is (A) $x\sqrt{3} + y + 8 = 0$ (B) $x\sqrt{3} - y = 8$ (C) $x\sqrt{3} - y = 8$ (D) $x - \sqrt{3}y + 8 = 0$

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194. The number of integral values of m for which the x-coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer is (a)2 (b) 0 (c) 4 (d) 1

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195. If the equation of base of an equilateral triangle is 2x - y = 1 and the vertex is (-1, 2), then the length of the side of the triangle is

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196. The equation of straight line passing through $(-a, 0)$ and making a triangle with the axes of area T is (a) $2Tx + a^2y + 2aT = 0$ (b) $2Tx - a^2y + 2aT = 0$ (c)$2Tx - a^2y - 2aT = 0$ (d)none of these

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197. The line PQ whose equation is $x - y = 2$ cuts the x-axis at P ,and Q is (4,2). The line PQ is rotated about P through 45° in the anticlockwise direction. The equation of the line PQ in the new position is (A) $y = -\sqrt{2}$ (B) $y = 2$ (C) $x = 2$ (D) $x = -2$

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198. If the equation of the locus of a point equidistant from the points (a_1, b_1) and (a_2, b_2) is $(a_1 - a_2)x + (b_1 - b_2)y + c = 0$, then the value of c is

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199. The extremities of the base of an isosceles triangle are $(2, 0) and (0, 2)$. If the equation of one of the equal side is $x = 2,$ then the equation of other equal side is (a)$x + y = 2$ (b) $x - y + 2 = 0$ (c) $y = 2$ (d) $2x + y = 2$

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200. A triangle is formed by the lines $x+y=0, x-y=0,$ and $lx+my=1$. If l and m vary subject to the condition $l^2+m^2=1$, then the locus of its circumcenter is (a) $(x^2-y^2)^2=x^2+y^2$ (b) $(x^2+y^2)^2=(x^2-y^2)$ (c) $(x^2+y^2)^2=4x^2y^2$ (d) $(x^2-y^2)^2=(x^2+y^2)^2$

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201. The line $x+y=p$ meets the x- and y-axes at $A and B$, respectively. A triangle APQ is inscribed in triangle OAB, O being the origin, with right angle at $Q\dot{P}$ and Q lie, respectively, on $OB and AB$. If the area of triangle APQ is $\frac{3}{8}th$ of the are of triangle $OAB,$ the $\frac{AQ}{BQ}$ is equal to (a)2(b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d)3

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202. A is a point on either of two lines $y+\sqrt{3}|x|=2$ at a distance of $\frac{4}{\sqrt{3}}$ units from their point of intersection. The coordinates of the foot of perpendicular from A on the bisector of the angle between them are (a) $\left(-\frac{2}{\sqrt{3}}, 2\right)$ (b) $(0, 0)$ (c) $\left(\frac{2}{\sqrt{3}}, 2\right)$ (d) $(0, 4)$

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203. A pair of perpendicular straight lines is drawn through the origin forming with the line $2x+3y=6$ an isosceles triangle right-angled at the origin. The equation to the line pair is a. $5x^2-24xy-5y^2=0$ b. $5x^2-26xy-5y^2=0$ c.$5x^2+24xy-5y^2=0$ d. $5x^2+26xy-5y^2=0$

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204. If the vertices $PandQ$ of a triangle PQR are given by (2, 5) and $(4, -11)$, respectively, and the point R moves along the line N given by

$9x + 7y + 4 = 0$, then the locus of the centroid of triangle PQR is a straight line parallel to PQ (b) QR (c) RP (d) N

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205. Given $A \equiv (1, 1)$ and AB is any line through it cutting the x-axis at B. If AC is perpendicular to AB and meets the y-axis in C , then the equation of the locus of midpoint P of BC is (a) $x + y = 1$ (b) $x + y = 2$ (c) $x + y = 2xy$ (d) $2x + 2y = 1$

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206. The straight lines $4ax + 3by + c = 0$, where $a + b + c$ are concurrent at the point a) $(4, 3)$ b) $\left(\frac{1}{4}, \frac{1}{3}\right)$ c) $\left(\frac{1}{2}, \frac{1}{3}\right)$ d) none of these

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207. The line parallel to the x-axis and passing through the intersection of the lines ax + 2by + 3b = 0 and bx – 2 ay – 3a = 0, where $(a, b) \neq (0, 0)$ is

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208. The line $L_1 : y - x = 0$ and $L_2 : 2x + y = 0$ intersect the line $L_3 : y + 2 = 0$ at P and Q respectively. The bisector of the acute angle between L_1 and L_2 intersects L_3 at R. Statement-1 : The ratio $PR : RQ$ equals $2\sqrt{2} : \sqrt{5}$ Statement-2 : In any triangle, bisector of an angle divides the triangle into two similar triangles. Statement-1 is true, Statement-2 is true ; Statement-2 is correct explanation for Statement-1 Statement-1 is true, Statement-2 is true ; Statement-2 is not a correct explanation for Statement-1 Statement-1 is true, Statement-2 is false Statement-1 is false, Statement-2 is true

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209. If the lines $ax + y + 1 = 0, x + by + 1 = 0,$ and $x + y + c = 0(a, b, c$ being distinct and different from 1) are concurrent, then $\left(\frac{1}{1-a}\right) + \left(\frac{1}{1-b}\right) + \left(\frac{1}{1-c}\right) =$ (a)0 (b) 1 (c)$\frac{1}{(a+b+c)}$

(d) none of these

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210. Two sides of a rhombus ABCD are parallel to the lines y = x + 2 and y = 7x + 3 If the diagonals of the rhombus intersect at the point (1, 2) and the vertex A is on the y-axis, then vertex A can be

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211. Equation(s) of the straight line(s), inclined at 30^0 to the x-axis such that the length of its (each of their) line segment(s) between the coordinate axes is 10 units, is (are) (a) $x + \sqrt{3}y + 5\sqrt{3} = 0$ (b) $x - \sqrt{3}y + 5\sqrt{3} = 0$ (c)$x + \sqrt{3}y - 5\sqrt{3} = 0$ (d)$x - \sqrt{3}y - 5\sqrt{3} = 0$

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212. If a pair of perpendicular straight lines drawn through the origin forms an isosceles triangle with the line $2x + 3y = 6$, then area of the triangle so formed is (a) $\frac{36}{13}$ (b) $\frac{12}{17}$ (c) $\frac{13}{5}$ (d) $\frac{17}{14}$

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213. The image of $P(a, b)$ on the line $y = -x$ is Q and the image of Q on the line $y = x$ is R . Then the midpoint of PR is (a) $(a + b, b + a)$ (b) $\left(\frac{a+b}{2}, \frac{b+2}{2}\right)$ (c) $(a - b, b - a)$ (d) $(0, 0)$

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214. Consider a ΔABC whose sides AB, BC, and CA are represented by the straight lines 2x+y=0, x+py=q, and x-y=3, respectively. The point P(2,3) is the orthocenter. The value of (p+q) is____.

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215. Find the area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pair of lines $x^2 - y^2 + 4y - 4 = 0$

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216. The sides of a triangle have the combined equation $x^2 - 3y^2 - 2xy + 8y - 4 = 0$. The third side, which is variable, always passes through the point $(-5, -1)$. Find the range of values of the slope of the third line such that the origin is an interior point of the triangle.

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217. The equation of the lines passing through the point $(1, 0)$ and at a distance $\frac{\sqrt{3}}{2}$ from the origin is (a)$\sqrt{3}x + y - \sqrt{3}$ =0 (b) $x + \sqrt{3}y - \sqrt{3} = 0$ (c) $\sqrt{3}x - y - \sqrt{3} = 0$ (d) $x - \sqrt{3}y - \sqrt{3} = 0$

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218. The number of values of k for which the lines $(k+1)x+8y=4kandkx+(k+3)y=3k-1$ are coincident is __________

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219. For all real values of $aandb,$ lines $(2a+b)x+(a+3b)y+(b-3a)=0$ and $mx+2y+6=0$ are concurrent. Then m is equal to______

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220. The line x= C cuts the triangle with vertices (0, 0), (1, 1), and (9, 1) into two regions. For the areas of the two regions to be the same, C must be equal to ____.

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221. The absolute value of the sum of the abscissas of all the points on the line $x + y = 4$ that lie at a unit distance from the line $4x + 3y - 10 = 0$ is__________

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222. The point (x, y) lies on the line $2x + 3y = 6.$ The smallest value of the quantity $\sqrt{x^2 + y^2}$ is $m\cdot$ then the value of $\sqrt{13}\,m$ is______

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223. The equations of the perpendicular bisectors of the sides $ABandAC$ of triangle ABC are $x - y + 5 = 0$ and $x + 2y = 0$, respectively. If the point A is $(1, -2)$, then find the equation of the line $BC\cdot$

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224. One of the diagonals of a square is the portion of the line $\frac{x}{2} + \frac{y}{3} = 2$ intercepted between the axes. Then the extremities of the other diagonal are: (a) $(5, 5), (-1, 1)$ (b) $(0, 0), (4, 6)$ (c) $(0, 0), (-1, 1)$ (d) $(5, 5), 4, 6)$

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225. Two sides of a triangle are along the coordinate axes and the medians through the vertices (other than the origin) are mutually perpendicular. The number of such triangles is/are zero (b) two (c) four (d) infinite

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226. The graph of $y^2 + 2xy + 40|x| = 400$ divides the plane into regions. Then the area of the bounded region is (a)$200 sq. units$ (b) $400 sq. units$ (c)$800 sq. units$ (d) $500 sq. units$

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227. In a triangle ABC, $A = (\alpha, \beta) B = (2, 3), and C = (1, 3)\cdot$ Point A lies on line $y = 2x + 3,$ where $\alpha \in I\cdot$ The area of $\Delta ABC,$, is such that $[\Delta] = 5$. The possible coordinates of A are (where [.] represents greatest integer function). (a)$(2, 3)$ (b) $(5, 13)$ (c)$(-5, -7)$ (d) $(-3, -5)$

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228. If the straight lines $2x + 3y - 1 = 0, x + 2y - 1 = 0$,and $ax + by - 1 = 0$ form a triangle with the origin as orthocentre, then (a, b) is given by (a) $(6, 4)$ (b) $(-3, 3)$ (c) $(-8, 8)$ (d) $(0, 7)$

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229. Let O be the origin. If $A(1, 0) and B(0, 1) and P(x, y)$ are points such that $xy > 0 and x + y < 1,$ then (a)P lies either inside the triangle

OAB or in the third quadrant. (b)P cannot lie inside the triangle OAB (c)P lies inside the triangle OAB (d)P lies in the first quadrant only

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230. If the area of the rhombus enclosed by the lines $lx \pm my \pm n = 0$ is 2 sq. units, then, a) l,m,n are in G.P b) l,n,m are in G.P. c) lm=n d) ln=m

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231. In a triangle ABC , the bisectors of angles $BandC$ lies along the lines $x = yandy = 0$. If A is $(1, 2)$, then the equation of line BC is (a) $2x + y = 1$ (b) $3x - y = 5$ (c) $x - 2y = 3$ (d) $x + 3y = 1$

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232. If $\frac{a}{\sqrt{bc}} - 2 = \sqrt{\frac{b}{c}} + \sqrt{\frac{c}{b}},$ where $a, b, c > 0,$ then the family of lines $\sqrt{a}x + \sqrt{b}y + \sqrt{c} = 0$ passes though the fixed point given by (a)

$(1, 1)$ (b) $(1, -2)$ (c)$(-1, 2)$ (d) $(-1, 1)$

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233. $P(m, n)$ (where m, n are natural numbers) is any point in the interior of the quadrilateral formed by the pair of lines $xy = 0$ and the lines $2x + y - 2 = 0$ and $4x + 5y = 20$. The possible number of positions of the point P is. 7 (b) 5 (c) 4 (d) 6

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234. A diagonal of rhombus $ABCD$ is member of both the families of lines $(x + y - 1) + \lambda 1(2x + 3y - 2) = 0$and $(x - y + 2) + \lambda 2(2x - 3y + 5) = 0$ and rhombus is (3, 2). If the area of the rhombus is $12\sqrt{5}$ sq. units, then find the remaining vertices of the rhombus.

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235. A regular polygon has two of its consecutive diagonals as lines $\sqrt{3}x + y = \sqrt{3}$ and $2y = \sqrt{3}$. Point (1,c) is one of its vertices. Find the equation of the sides of the polygon and also find the coordinates of the vertices.

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236. Find the locus of the circumcenter of a triangle whose two sides are along the coordinate axes and the third side passes through the point of intersection of the line $ax + by + c = 0$ and $lx + my + n = 0$.

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237. A line $L_1 \equiv 3y - 2x - 6 = 0$ is rotated about its point of intersection with the y-axis in the clockwise direction to make it L_2 such that the are formed by L_1, L_2 the x-axis, and line $x = 5$ is $\frac{49}{3} squnits$ if its point of intersection with $x = 5$ lies below the x-axis. Find the equation of L_2.

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238. Show that the reflection of the line $ax+by+c=0$ on the line $x+y+1=0$ is the line $b+ay+(a+b-c)=0$ where $a \neq b$.

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239. Two equal sides of an isosceles triangle are 7x-y+3=0 and x+y-3=0. Its third side passes the point (1,-10).

Determine the equation of the third side.

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240. The number of possible straight lines passing through (2,3) and forming a triangle with the coordinate axes, whose area is 12sq. Units, is

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241. In a triangle ABC , if A is $(2, -1), and 7x - 10y + 1 = 0$ and $3x - 2y + 5 = 0$ are the equations of an altitude and an angle bisector, respectively, drawn from B , then the equation of BC is (a) $a + y + 1 = 0$ (b)$5x + y + 17 = 0$ (c)$4x + 9y + 30 = 0$ (d) $x - 5y - 7 = 0$

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242. The sides of a triangle are the straight lines $x + y = 1, 7y = x,$ and $\sqrt{3}y + x = 0$. Then which of the following is an interior point of the triangle? (a)Circumcenter (b) Centroid (c)Incenter (d) Orthocenter

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243. One of the diameter of a circle circumscribing the rectangle ABCD is $4y = x + 7$, If A and B are the points $(-3, 4)$ and $(5, 4)$ respectively, then the area of rectangle is

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244. The coordinates of two consecutive vertices A and B of a regular hexagon $ABCDEF$ are $(1, 0)$ and $(2, 0)$, respectively. The equation of the diagonal CE is

A. (a)$\sqrt{3}x + y = 4$

B. (b) $x + \sqrt{3}y + 4 = 0$

C. (c)$x + \sqrt{3}y = 4$

D. (d) none of these

Answer: null

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245. P is a point on the line $y + 2x = 1$, and Q and R two points on the line $3y + 6x = 6$ such that triangle PQR is an equilateral triangle. The length of the side of the triangle is (a)$\frac{2}{\sqrt{5}}$ (b) $\frac{3}{\sqrt{5}}$ (c) $\frac{4}{\sqrt{5}}$ (d) none of these

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246. Distance of origin from the line $(1+\sqrt{3})y+(1-\sqrt{3})x=10$ along the line $y=\sqrt{3}x+k$

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247. In $\triangle ABC$, the coordinates of the vertex A are , $(4, -1)$ and lines $x-y-1=0$ and $2x-y=3$ are the internal bisectors of angles B and C . Then the radius of the circles of triangle AbC is

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248. If the equation of any two diagonals of a regular pentagon belongs to the family of lines $(1+2\lambda)y-(2+\lambda)x+1-\lambda=0$ and their lengths are sin 36^0 , then the locus of the center of circle circumscribing the given pentagon (the triangles formed by these diagonals with the sides of pentagon have no side common) is (a)

$x^2 + y^2 - 2x - 2y + 1 + \sin^2 72^0 = 0$ (b)

$x^2 + y^2 - 2x - 2y + \cos^2 72^0 = 0$ (c)

$x^2 + y^2 - 2x - 2y + 1 + \cos^2 72^0 = 0$ (d)

$x^2 + y^2 - 2x - 2y + \sin^2 72^0 = 0$

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249. If it is possible to draw a line which belongs to all the given family of lines

$y - 2x + 1 + \lambda_1(2y - x - 1) = 0, 3y - x - 6 + \lambda_2(y - 3x + 6) = 0, ax +$

, then

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250. The locus of the image of the point $(2, 3)$ in the line $(x - 2y + 3) + \lambda(2x - 3y + 4) = 0$ is$(\lambda \in R)$ (a) $x^2 + y^2 - 3x - 4y - 4 = 0$ (b) $2x^2 + 3y^2 + 2x + 4y - 7 = 0$ (c) $x^2 + y^2 - 2x - 4y + 4 = 0$ (d) none of these

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251. ABC is a variable triangle such that A is (1,2) and B and C lie on line $y = x + \lambda$ (where λ is a variable). Then the locus of the orthocentre of triangle ABC is (a) $(x-1)^2 + y^2 = 4$ (b) $x + y = 3$ (c) $2x - y = 0$ (d) none of these

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252. If $P\left(1 + \frac{t}{\sqrt{2}}, 2 + \frac{t}{\sqrt{2}}\right)$ is any point on a line, then the range of the values of t for which the point P lies between the parallel lines $x + 2y = 1 and 2x + 4y = 15.$ is (a) $\frac{4\sqrt{2}}{3} < t < 5\left(\sqrt{2}\right)6$ (b) $0 < t < \left(5\sqrt{2}\right)$ (c) $4\sqrt{2} < t < 0$ (d) none of these

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253. If the intercepts made by the line $y = mx$ by lines $x = 2$ and $x = 5$ is less than 5, then the range of values of m is a.

$\left(-\infty, -\frac{4}{3}\right) \cup \left(\frac{4}{3}, \infty\right)$ b. $\left(-\frac{4}{3}, \frac{4}{3}\right)$ c. $\left(-\frac{3}{4}, \frac{4}{3}\right)$ d. none of these

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254. If the extremities of the base of an isosceles triangle are the points $(2a, 0)$ and (0, a), and the equation of one of the side is $x = 2a,$ then the area of the triangle is (a)$5a^2 sq\dot{u}nits$ (b) $\frac{5a^2}{2} sq\dot{u}nits$ (c)$\frac{25a^2}{2} sq\dot{u}nits$ (d) none of these

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255. The coordinates of the foot of the perpendicular from the point $(2, 3)$ on the line $-y + 3x + 4 = 0$ are given by (a)$\left(\frac{37}{10}, -\frac{1}{10}\right)$ (b) $\left(-\frac{1}{10}, \frac{37}{10}\right)$ (c)$\left(\frac{10}{37}, -10\right)$ (d) $\left(\frac{2}{3}, -\frac{1}{3}\right)$

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256. The straight lines $x+2y-9=0, 3x+5y-5=0$, and $ax+by-1=0$ are concurrent, if the straight line $35x-22y+1=0$ passes through the point (a)(a, b) (b) (b, a) (c)$(-a, -b)$ (d) none of these

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257. If lines $x+2y-1=0, ax+y+3=0,$ and $bx-y+2=0$ are concurrent, and S is the curve denoting the locus of (a, b) , then the least distance of S from the origin is (a)$\frac{5}{\sqrt{57}}$ (b) $\frac{5}{\sqrt{51}}$ (c)$\frac{5}{\sqrt{58}}$ (d) $\frac{5}{\sqrt{59}}$

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258. $L_1 and L_2$ are two lines. If the reflection of $L_1 on L_2$ and the reflection of L_2 on L_1 coincide, then the angle between the lines is (a)30^0 (b) 60^0 (c) 45^0 (d) 90^0

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259. $A \equiv (-4, 0), B \equiv (4, 0) \dot{M} and N$ are the variable points of the y-axis such that M lies below $N and MN = 4$. Lines $AM and BN$ intersect at P. The locus of P is a. $2xy - 16 - x^2 = 0$ b. $2xy + 16 - x^2 = 0$ c. $2xy + 16 + x^2 = 0$ d. $2xy - 16 + x^2 = 0$

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260. If $\sin(\alpha + \beta)\sin(\alpha - \beta) = \sin\gamma(2\sin\beta + \sin\gamma)$, where $0 < \alpha, \beta, \gamma < \pi$, then the straight line whose equation is $x\sin\alpha + y\sin\beta - \sin\gamma = 0$ passes through point (a) $(1, 1)$ (b) $(-1, 1)$ (c) $(1, -1)$ (d) none of these

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261. Let P be (5,3) and a point R on y = x and Q on the X - axis be such that $PQ + QR + RP$ is minimum ,then the coordinates of Q are

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262. Given A(0,0) and B(x,y) with x $\in$ (0,1) and y>0. Let the slope of line AB be m_1. Point C lies on line $x = 1$ such that the slope of BC is equal to m_2 where$0 < m_2 < m_1$ If the area of triangle ABC can be expressed as $(m_1 - m_2)f(x)$ then the largest possible value of x is

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263. If the straight lines $x + y - 2 - 0, 2x - y + 1 = 0$ and $ax + by - c = 0$ are concurrent, then the family of lines $2ax + 3by + c = 0(a, b, c)$ are nonzero) is concurrent at (a) $(2, 3)$ (b) $\left(\frac{1}{2}, \frac{1}{3}\right)$ (c) $\left(-\frac{1}{6}, -\frac{5}{9}\right)$ (d) $\left(\frac{2}{3}, -\frac{7}{5}\right)$

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264. The equaiton of the lines through the point (2, 3) and making an intercept of length 2 units between the lines $y + 2x = 3$ and $y + 2x = 5$ are

A. (A) $x+3=0, 3x+4y=12$

B. (B) $y-2=(0, 4x-3y=6$

C. (C) $x-2=0, 3x+4y=18$

D. (D) none of these

Answer: null

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265. A beam of light is sent along the line $x-y=1$, which after refracting from the x-axis enters the opposite side by turning through 30^0 towards the normal at the point of incidence on the x-axis. Then the equation of the refracted ray is (a) $(2-\sqrt{3})x-y=2+\sqrt{3}$ (b) $(2+\sqrt{3})x-y=2+\sqrt{3}$ (c) $(2-\sqrt{3})x+y=(2+\sqrt{3})$ (d) $y=(2-\sqrt{3})(x-1)$

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266. Determine all the values of α for which the point (α, α^2) lies inside the triangle formed by the lines. $2x + 3y - 1 = 0$ $x + 2y - 3 = 0$ $5x - 6y - 1 = 0$

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267. If the equation $2x + 3y + 1 = 0, 3x + y - 2 = 0, and ax + 2y - b = 0$ are consistent, then prove that $a - b = 2.$

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268. If $u = a_1x + b_1y + c_1 = 0, v = a_2x + b_2y + c_2 = 0,$ and $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2},$ then the curve $u + kv = 0$ is (a)the same straight line u (b)different straight line (c)not a straight line (d)none of these

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269. The point $A(2, 1)$ is translated parallel to the line $x - y = 3$ by a distance of 4 units. If the new position A' is in the third quadrant, then the coordinates of A' are (A) $(2 + 2\sqrt{2}, 1 + 2\sqrt{2})$ (B) $(-2 + \sqrt{2}, -1 - 2\sqrt{2})$ (C) $(2 - 2\sqrt{2}, 1 - 2\sqrt{2})$ (D) none of these

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270. Let ABC be a triangle. Let A be the point $(1, 2)$, $y = x$ be the perpendicular bisector of AB, and $x - 2y + 1 = 0$ be the angle bisector of $\angle C$. If the equation of BC is given by $ax + by - 5 = 0$, then the value of $a + b$ is (a)1(b) 2(c) 3 (d) 4

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271. The area enclosed by $2|x| + 3|y| \leq 6$ is (a)3 sq. units (b) 4 sq. units (c)12 sq. units (d) 24 sq. units

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272. The lines $y = m_1 x, y = m_2 x and y = m_3 x$ make equal intercepts on the line $x + y = 1.$ Then (a) $2(1 + m_1)(1 + m_3) = (1 + m_2)(2 + m_1 + m_3)$ (b) $(1 + m_1)(1 + m_3) = (1 + m_2)(1 + m_1 + m_3)$ (c) $(1 + m_1)(1 + m_2) = (1 + m_3)(2 + m_1 + m_3)$ (d) $2(1 + m_1)(1 + m_3) = (1 + m_2)(1 + m_1 + m_3)$

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273. The condition on a and b , such that the portion of the line $ax + by - 1 = 0$ intercepted between the lines $ax + y = 0$ and $x + by = 0$ subtends a right angle at the origin, is (a)$a = b$ (b) $a + b = 0$ (c)$a = 2b$ (d) $2a = b$

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274. One diagonal of a square is along the line $8x - 15y = 0$ and one of its vertex is (1, 2). Then the equations of the sides of the square passing through this vertex are a. $23x + 7y = 9, 7x + 23y = 53$ b. $23x - 7y + 9 = 0, 7x + 23y + 53 = 0$ c. $23x - 7y - 9 = 0, 7x + 23y - 53 = 0$ d.none of these

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275. The straight line $ax + by + c = 0$, where $abc \neq 0,$ will pass through the first quadrant if (a) $ac > 0, bc > 0$ (b) $ac > 0$ or $bc < 0$ (c) $bc > 0$ or $ac > 0$ (d) $ac < 0$ or $bc < 0$

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276. A square of side a lies above the x-axis and has one vertex at the origin. The side passing through the origin makes and angle α ($0 < \alpha < \frac{\pi}{4}$) with the positive direction of x-axis. The equation of its diagonal not passing through the origin is

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277. If the sum of the distances of a point from two perpendicular lines in a plane is 1, then its locus is a (a) square (b) a circle (c) a straight line

(d) two intersecting lines

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278. ABC is a variable triangle such that A is (1,2) and B and C lie on line $y = x + \lambda$ (where λ is a variable). Then the locus of the orthocentre of triangle ABC is $(x-1)^2 + y^2 = 4$ $x + y = 3$ $2x - y = 0$ (d) none of these

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279. . The lines $(a+b)x + (a-b)y - 2ab = 0$, $(a-b)x + (a+b)y - 2ab = 0$ and $x + y$ form an isosceles triangle whose vertical angle is

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280. Each equation contains statements given in two columns which have to be matched. Statements (a,b,c,d) in column I have to be matched with Statements (p, q, r, s) in column II. If the correct match are $a\vec{p}, a\vec{s}, b\vec{q}, b\vec{r}, c\vec{p}, c\vec{q},$ and $d\vec{s}$, then the correctly bubbled $4x4$ matrix should be as follows: Figure Consider the lines represented by equation $(x^2+xy-x)x(x-y)=0,$ forming a triangle. Then match the following: Column I|Column II Orthocenter of triangle |p. $\left(\frac{1}{6}, \frac{1}{2}\right)$ Circumcenter|q. $\left(1(2+2\sqrt{2}), \frac{1}{2}\right)$ Centroid|r. $\left(0, \frac{1}{2}\right)$ Incenter|s. $\left(\frac{1}{2}, \frac{1}{2}\right)$

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281. The straight lines $3x+4y=5$ and $4x-3y=15$ interrect at a point $A(3, -1)$. On these linepoints B and C are chosen so that $AB=AC$. Find the possible eqns of the line BC pathrough the point $(1, 2)$

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282. The area of the triangular region in first quadrant bounded on the left by the line $7x + 4y = 168,$ and bounded below by the line $5x + 3y = 121$ is A . Then the value of $\frac{3A}{10}$ is_______

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283. Find the area enclosed by the graph of $x^2y^2 - 9x^2 - 25y^2 + 225 = 0$

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284. Line $L_1 \equiv ax + by + c = 0$ and $L_2 \equiv lx + my + n = 0$ intersect at point P and make an angle θ with each other Find the equation of a line different from L_2 which passes through P and makes the same angle θ with L_1.

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285. Let ABC be a triangle with $AB = AC$. If D is the midpoint of BC, E is the foot of the perpendicular drawn from D to AC, $and F$ is the midpoint of DE, then prove that AF is perpendicular to BE.

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286. For $a > b > c > 0$, if the distance between $(1, 1)$ and the point of intersection of the line $ax + by - c = 0$ is less than $2\sqrt{2}$ then,

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287. A straight line L through the point (3,-2) is inclined at an angle 60° to the line $\sqrt{3}x + y = 1$ If L also intersects the x-axis then the equation of L is

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288. The locus of the orthocentre of the triangle formed by the lines $(1+p)x - py + p(1+p) = 0, (1+q)x - qy + q(1+q) = 0$ and y = 0, where $p \neq \cdot q$, is (A) a hyperbola (B) a parabola (C) an ellipse (D) a straight line

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289. The vertices of a triangle are $(A(-1, -7), B(5,1),$ and $C(1,4)$. The equation of the bisector of $\angle ABC$ is___

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290. If the algebraic sum of the distances from the points (2,0), (0, 2) and (1, 1) to a variable line be zero then the line passes through the fixed point.

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291. A straight line through the origin O meets the parallel lines 4x+2y=9 and 2x+y+6=0 at points P and Q, respectively. Then the point O divides the segment PQ in the ratio

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292. A rectangle PQRS has its side PQ parallel to the line $y = mx$ and vertices P, Q, and S on the lines $y = a$, $x = b$,and $x = -b$, respectively. Find the locus of the vertex R.

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293. The area of the triangle formed by the intersection of a line parallel to x-axis and passing through P (h, k) with the lines y = x and x + y = 2 is $4h^2$. Find the locus of the point P.

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294. The set of lines ax + by + c = 0 where 3a + 2b + 4c = 0 intersect at the point

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295. The area enclosed by the curve |x| + |y| = 1 is

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296. Find the orthocentre of the triangle the equations of whose sides are $x + y = 1, 2x + 3y = 6 and 4x - y + 4 = 0.$

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297. If a, b, c are in AP then ax + by + c = 0 will always pass through a fixed point whose coordinates are

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298. Statement-I: If the diagonals of the quadrilateral formed by the lines $px + gy + r = 0, p'x + gy + r' = 0, p'x + q'y + r' = 0$, are at right angles, then $p^2 + q^2 = p'^2 + q'^2$. Statement-2: Diagonals of a rhombus are bisected and perpendicular to each other.

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299. Statement 1: The internal angle bisector of angle C of a triangle ABC with sides $AB, AC,$ and BC as $y = 0, 3x + 2y = 0,$ and $2x + 3y + 6 = 0$, respectively, is $5x + 5y + 6 = 0$ Statement 2: The image of point A with respect to 5x+5y+6=0 lies on the side BC of the triangle.

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300. The joint equation of lines $y = xandy = -x$ is $y^2 = -x^2$, i.e., $x^2 + y^2 = 0$ Statement 2: The joint equation of lines $ax + by = 0$ and

$cx + dy = 0$ is $(ax + by)(cx + dy) = 0$, wher a, b, c, d are constant.

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301. Statement 1: If the sum of algebraic distances from point $A(1, 1), B(2, 3), C(0, 2)$ is zero on the line $ax + by + c = 0$, then $a + 3b + c = 0$ Statement 2: The centroid of the triangle is (1, 2)

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302. Each question has four choice: a, b, c and d, out of which only one is correct. Each question contains Statement 1 and Statement 2. Find the correct answer. Both the Statements are true but Statement 2 is the correct explanation of Statement 1. Both the Statement 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 Statement 1: The lines $(a + b)x + (a - 2b)y = a$ are con-current at the point $\left(\frac{2}{3}, \frac{1}{3}\right)$. Statement 2: The lines $x+y-1=0$ and $x-2y=0$ intersect at the point $\left(\frac{2}{3}, \frac{1}{3}\right)$.

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303. Statement 1:If the point $(2a-5, a^2)$ is on the same side of the line $x+y-3=0$ as that of the origin, then $a \in (2, 4)$ Statement 2: The points $(x_1, y_1) and (x_2, y_2)$ lie on the same or opposite sides of the line $ax+by+c=0$, as ax_1+by_1+c and ax_2+by_2+c have the same or opposite signs.

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304. Statement 1: Each point on the line $y-x+12=0$ is equidistant from the lines $4y+3x-12=0, 3y+4x-24=0$ Statement 2: The locus of a point which is equidistant from two given lines is the angular bisector of the two lines.

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305. If lines $px + qy + r = 0, qx + ry + p = 0 and rx + py + q = 0$ are concurrent, then prove that $p + q + r = 0(where p, q, r$ are distinct$)$.

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306. the diagonals of the parallelogram formed by the the lines $a_1x + b_1y + c_1 = 0$,$a_1x + b_1y + c_1' = 0$, $a_2x + b_2y + c_1 = 0$, $a_2x + b_2y + c_1' = 0$ will be right angles if:

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307. If the lines joining the origin and the point of intersection of curves $ax^2 + 2hxy + by^2 + 2gx + 0$ and $a_1x^2 + 2h_1xy + b_1y^2 + 2g_1x = 0$ are mutually perpendicular, then prove that $g(a_1 + b_1) = g_1(a + b)$.

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308. 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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309. 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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310. If $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ bisect angles between each other, then find the condition.

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311. Find the value of a for which the lines represented by $ax^2+5xy+2y^2=0$ are mutually perpendicular.

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312. Find the acute angle between the pair of lines represented by $x(\cos\alpha - y\sin\alpha)^2 = (x^2+y^2)\sin^2\alpha$

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313. If the angle between the two lines represented by $2x^2+5xy+3y^2+6x+7y+4=0$ is $\tan^{-1}(m)$, then find the value of m.

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314. If the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is rotated about the origin through 90^0, then find the equations in the new position.

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315. The orthocentre of the triangle formed by the lines x = 0, y = 0 and x + y = 1 is

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316. 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

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317. If the slope of one line is double the slope of another line and the combined equation of the pair of lines is $\left(\frac{x^2}{a}\right) + \left(\frac{2xy}{h}\right) + \left(\frac{y^2}{b}\right) = 0$, then find the ratio $ab : h^2$.

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318. Find the combined equation of the pair of lines through the point (1, 0) and parallel to the lines represented by $2x^2 - xy - y^2 = 0$

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319. The value k for which $4x^2 + 8xy + ky^2 = 9$ is the equation of a pair of straight lines is________

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320. The two lines represented by $3ax^2 + 5xy + (a^2 - 2)y^2 = 0$ are perpendicular to each other for (a)two values of a (b) a (c)for one value of a (d) for no values of a

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321. If two lines represented by $x^4 + x^3y + cx^2y^2 - xy^3 + y^4 = 0$ bisect the angle between the other two, then the value of c is (a)0 (b) -1 (c) 1 (d) -6

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322. The straight lines represented by $x^2 + mxy - 2y^2 + 3y - 1 = 0$ meet at (a)$\left(-\frac{1}{3}, \frac{2}{3}\right)$ (b) $\left(-\frac{1}{3}, -\frac{2}{3}\right)$ (c)$\left(\frac{1}{3}, \frac{2}{3}\right)$ (d) none of these

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323. The straight lines represented by the equation $135x^2 - 136xy + 33y^2 = 0$ are equally inclined to the line (a)$x - 2y = 7$ (b) x+2y=7 (c)$x - 2y = 4$ (d) $3x + 2y = 4$

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324. 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)1 (b) 2 (c) $-\frac{1}{2}$ (d) -1

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325. Statement 1 : If $-2h = a + b,$ 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.

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326. Show that all chords of the curve $3x^2 - y^2 - 2x + 4y = 0,$ which subtend a right angle at the origin, pass through a fixed point. Find the coordinates of the point.

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327. Area of the triangle formed by the lines $y^2 - 9xy + 18x^2 = 0 and y = 6$ is___

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328. The distance between the lines $(x + 7y)^2 + 4\sqrt{2}(x + 7y) - 42 = 0$ is___________

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329. $x + y = 7$ and $ax^2 + 2hxy + ay^2 = 0, (a \neq 0)$, are three real distinct lines forming a triangle. Then the triangle is (a) isosceles (b) scalene (c) equilateral (d) right angled

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330. If the slope of one of the lines represented by $ax^2 + 2hxy + by^2 = 0$ is the square of the other, then $\frac{a+b}{h} + \frac{8h^2}{ab} =$

(a) 4 (b) 6 (c) 8 (d) none of these

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331. Find the area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pair of lines $x^2 - y^2 + 4y - 4 = 0$

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332. The sides of a triangle have the combined equation $x^2 - 3y^2 - 2xy + 8y - 4 = 0$. The third side, which is variable, always passes through the point $(-5, -1)$. Find the range of values of the slope of the third line such that the origin is an interior point of the triangle.

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333. Let PQR be a right-angled isosceles triangle, right angled at $P(2, 1)$. If the equation of the line QR is $2x + y = 3$, then the equation representing the pair of lines PQ and PR is (a)

$3x^2 - 3y^2 + 8xy + 20x + 10y + 25 = 0$ (b)

$3x^2 - 3y^2 + 8xy - 20x - 10y + 25 = 0$ (c)

$3x^2 - 3y^2 + 8xy + 10x + 15y + 20 = 0$ (d)

$3x^2 - 3y^2 - 8xy - 15y - 20 = 0$

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334. The combined equation of three sides of a triangle is $(x^2 - y^2)(2x + 3y - 6) = 0$. If $(-2, a)$ is an interior point and $(b, 1)$ is an exterior point of the triangle, then (a)$2 < a < \frac{10}{3}$ (b) $-2 < a < \frac{10}{3}$ (c)$-1 < b < \frac{9}{2}$ (d) $-1 < b < 1$

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335. Find the equation of the bisectors of the angles between the lines joining the origin to the point of intersection of the straight line $x - y = 2$ with the curve $5x^2 + 11xy - 8y^2 + 8x - 4y + 12 = 0$

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336. If θ is the angle between the lines given by the equation $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$, then find the equation of the line passing through the point of intersection of these lines and making an angle θ with the positive x-axis.

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337. The distance of a point (x_1, y_1) from two straight lines which pass through the origin of coordinates is p. Find the combined equation of these straight lines.

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338. Prove that the product of the perpendiculars from (α, β) to the pair of lines $ax^2 + 2hxy + by^2 = 0$ is $\frac{a\alpha^2 - 2h\alpha\beta + \eta^2}{\sqrt{(a-b)^2 + 4h^2}}$

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339. Find the area enclosed by the graph of $x^2y^2 = 9x^2 - 25y^2 + 225 = 0$

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340. Show that the pairs of straight lines $2x^2 + 6xy + y^2 = 0$ and $4x^2 + 18xy + y^2 = 0$ have the same set of angular bisector.

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341. 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 $(a-b)\left(x^2 - y^2\right) + 4hxy = 0$.

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342. Find the angle between the straight lines joining the origin to the point of intersection of $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y = 1$

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343. Through a point A on the x-axis, a straight line is drawn parallel to the y-axis so as to meet the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ at B and C. If $AB = BC$, then (a)$h^2 = 4ab$ (b) $8h^2 = 9ab$ (c)$9h^2 = 8ab$ (d) $4h^2 = ab$

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344. Find the lines whose combined equation is $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$

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345. Does equation $x^2 + 2y^2 - 2\sqrt{3}x - 4y + 5 = 0$ satisfies the condition $abc + 2gh - af^2 - bg^2 - ch^2 = 0$? Does it represent a pair of straight lines?

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346. Find the value of λ if $2x^2 + 7xy + 3y^2 + 8x + 14y + \lambda = 0$ represents a pair of straight lines

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347. The distance between the pair of parallel lines $x^2 + 4xy + 4y^2 + 3x + 6y - 4 = 0$ is

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348. If the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the y-axis, then prove that $2fgh = bg^2 + ch^2$

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349. Find the joint equation of the pair of lines which pass through the origin and are perpendicular to the lines represented the equation $y^2 + 3xy - 6x + 5y - 14 = 0$

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

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351. If the gradient of one of the lines $x^2 + hxy + 2y^2 = 0$ is twice that of the other, then $h =$

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352. 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

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353. Two pairs of straight lines have the equations $y^2 + xy - 12x^2 = 0$ and $ax^2 + 2hxy + by^2 = 0$. One line will be common among them if. (a) $a + 8h - 16b = 0$ (b) $a - 8h + 16b = 0$ (c)$a - 6h + 9b = 0$ (d) $a + 6h + 9b = 0$

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354. 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)$a - 2$

(b) $a + 2$

(c)$\dfrac{2}{a+2}$

(d) $\dfrac{2}{a}$

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355. If one of the lines given by the equation $2x^2 + pxy + 3y^2 = 0$ coincide with one of those given by $2x^2 + qxy - 3y^2 = 0$ and the other lines represented by them are perpendicular, then (a)$p = 5$ (b) $p = -5$ (c)$q = -1$ (d) $q = 1$

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356. If $x^2 + 2hxy + y^2 = 0$ represents the equation of the straight lines through the origin which make an angle α with the straight line $y + x = 0$

(a)$sec2\alpha = h$

(b)$\cos\alpha = \sqrt{\frac{(1+h)}{(2h)}}$

(c)$2\sin\alpha = \sqrt{\frac{(1+h)}{h}}$

(d) $\cot\alpha = \sqrt{\frac{(1+h)}{(h-1)}}$

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357. The equation to a pair of opposite sides of a parallelogram are $x^2 - 5x + 6 = 0$ and $y^2 - 6y + 5 = 0$. The equations to its diagonals are (a)$x + 4y = 13, y = 4x - 7$ (b) $4x + y = 13, 4y = x - 7$ (c) $4x + y = 13, y = 4x - 7$ (d) $y - 4x = 13, y + 4x - 7$

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358. The equation $a^2x^2 + 2h(a + b)xy + b^2y^2 = 0$ and $ax^2 + 2hxy + by^2 = 0$ represent (a)two pairs of perpendicular straight lines (b)two pairs of parallel straight lines (c)two pairs of straight lines which are equally inclined to each other (d)none of these

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359. The equation $x^3 + x^2y - xy^2 = y^3$ represents (a)three real straight lines (b)lines in which two of them are perpendicular to each other (c)lines in which two of them are coincident (d)none of these

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

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361. The combined equation of the lines $l_1 and l_2$ is $2x^2 + 6xy + y^2 = 0$ and that of the lines $m_1 and m_2$ is $4x^2 + 18xy + y^2 = 0$. If the angle between l_1 and m_2 is α then the angle between $l_2 and m_1$ will be

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362. If the equation $ax^2 - 6xy + y^2 + 2gx + 2fy + c = 0$ represents a pair of lines whose slopes are m and m^2, then the value(s) of a is/are

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363. The equation of a line which is parallel to the line common to the pair of lines given by $6x^2 - xy - 12y^2 = 0$ and $15x^2 + 14xy - 8y^2 = 0$ and at a distance of 7 units from it is

(a)$3x - 4y = -35$

(b) $5x - 2y = 7$

(c) $3x + 4y = 35$

(d)$2x - 3y = 7$

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

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365. Area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pairs of straight lines $x^2 - y^2 + 2y = 1$ is $2 sq units$ (b) $4 sq units$ $6 sq units$ (d) $8 sq units$

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366. The equation $x^2y^2 - 9y^2 + 6x^2y + 54y = 0$ represents a pair of straight lines and a circle a pair of straight lines and a parabola a set of four straight lines forming a square none of these

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367. 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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368. 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 (a)$3x^2 + 8xy - 3y^2 = 0$ (b)$3x^2 + 10xy + 3y^2 = 0$ (c) $y^2 + 2xy - 3x^2 = 0$ (d) $x^2 + 2xy - 3y^2 = 0$

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369. The condition that one of the straight lines given by the equation $ax^2 + 2hxy + by^2 = 0$ may coincide with one of those given by the equation $a'x^2 + 2h'xy + b'y^2 = 0$ is

$(ab' - a'b)^2 = 4(ha' - h'a)(bh' - b'h)$

$(ab' - a'b)^2 = (ha' - h'a)(bh' - b'h)$

$(ha' - h'a)^2 = 4(ab' - a'b)(bh' - b'h)$

$(bh' - b'h)^2 = 4(ab' - a'b)(ha' - h'a)$

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370. If the represented by the equation $3y^2 - x^2 + 2\sqrt{3}x - 3 = 0$ are rotated about the point $(\sqrt{3}, 0)$ through an angle of 15^0, on in clockwise direction and the other in anticlockwise direction, so that they become perpendicular, then the equation of the pair of lines in the new position is (a)$y^2 - x^2 + 2\sqrt{3}x + 3 = 0$ (b)$y^2 - x^2 + 2\sqrt{3}x - 3 = 0$ (c) $y^2 - x^2 - 2\sqrt{3}x + 3 = 0$ (d) $y^2 - x^2 + 3 = 0$

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371. The angle between the pair of lines whose equation is $4x^2 + 10xy + my^2 + 5x + 10y = 0$ is $\tan^{-1}\left(\frac{3}{8}\right)$ $\tan^{-1}\left(\frac{3}{4}\right)$ $\tan^{-1}\left\{2\frac{\sqrt{25 - 4m}}{m + 4}\right\}, m \in R$ none of these

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372. Find the point of intersection of the pair of straight lines represented by the equation $6x^2 + 5xy - 21y^2 + 13x + 38y - 5 = 0.$

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373. Find the angle between the lines represented by $x^2 + 2xy\sec\theta + y^2 = 0$

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374. 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.

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375. If the equation $2x^2 + kxy + 2y^2 = 0$ represents a pair of real and distinct lines, then find the values of k.

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376. If the equation $x^2 + (\lambda + \mu)xy + \lambda uy^2 + x + \mu y = 0$ represents two parallel straight lines, then prove that $\lambda = \mu$.

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377. If one of the lines of the pair $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the positive direction of the axes. Then find the relation for a, b, h

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378. Prove that the equation $2x^2 + 5xy + 3y^2 + 6x + 7y + 4 = 0$ represents a pair of straight lines. Find the coordinates of their point of intersection and also the angle between them.

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379. A line L passing through the point (2, 1) intersects the curve $4x^2 + y^2 - x + 4y - 2 = 0$ at the point $AandB$. If the lines joining the origin and the points A, B are such that the coordinate axes are the bisectors between them, then find the equation of line L.

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380. 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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381. Prove that one of the straight lines given by $ax^2 + 2hxy + by^2 = 0$ will bisect the angle between the co-ordinate axes if $(a + b)^2 = 4h^2$.

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