MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

TWO DIMENSIONAL ANALYTICAL GEOMETRY

Exercise 6 1

1. Find the locus of P, if for all values of α, the co-ordinates of a moving point P is

$(9\cos\alpha, 9\sin\alpha)$

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2. Find the locus of P, if for all values of α, the co-ordinates of a moving point P is

$(9\cos\alpha, 6\sin\alpha)$

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3. Find the locus of a point P that moves at a constant distant of

two units from the X-axis

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4. Find the locus of a point P that moves at a constant distant of

three units from the Y-axis

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5. If θ is a parameter, find the equation of the locus of moving point, whose coordinates are $x = a\cos^3 y = a\sin^3\theta.$

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6. Find the value of k and b, if the points P(-3, 1) and Q(2, b) lie on the locus of $x^2 - 5x + ky = 0$.

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7. A straight rod of length 8 units slides with its ends A and B always on the x and y axes respectively. Find the locus of the mid point of the line segment AB.

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8. Find the equation of the locus of a point such that the sum of the squares of the distance from the

points (3, 5), (1, -1) is equal to 20.

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9. Find the equation of the locus of the point P such that the line segment AB, joining the points A(1, -6) and B(4, -2), subtends a right angle at P.

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10. If O is origin and R is a variable point on $y^2 = 4x$, then find the equation of the locus of the mid-point of the line segment OR.

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11. The coordinates of a moving point P are $\left(\frac{a}{2}(\cos ec\theta + \sin\theta), \frac{b}{2}(\cos ec\theta - \sin\theta)\right)$, where θ is a variable parameter. Show that the equation of the locus P is $b^2x^2 - a^2y^2 = a^2b^2$.

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12. If P(2,-7) is a given point and Q is a point on $\left(2x^2 + 9y^2 = 18\right)$, then find the equations of the locus of the mid-point of PQ.

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13. If R is any point on the x-axis and Q is any point on they y-axis and P is a variable point on RQ with RP=b, PQ=a, then find the equation of locus of P.

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14. If the points P(6,2) and Q(-2,1) and R are the vertices of a ΔPQR and R is the point on the locus of $y = x^2 - 3x + 4$, then find the equation of the locus of centroid of ΔPQR.

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15. If Q is a point on the locus of $x^2 + y^2 + 4x - 3y + 7 = 0$, then find the equation of locus of P which divides segment OQ externally in the ratio 3:4, where O is origin.

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16. Find the points on the locus of points that are 3 units from x-axis and 5 units from the point (5,1).

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17. The sum of the distance of a moving point from the points (4,0) and (-4,0) is always 10 units. Find the equation to the locus of the moving point.

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Exercise 6 2

1. Find the equation of the lines passing through the point (1,1)

with y-intercept (-4)

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2. Find the equation of the lines passing through the point (1,1)

with slope 3

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3. Find the equation of the lines passing through the point (1,1)

and (-2,3)

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4. Find the equation of the lines passing through the point (1,1)

and the perpendicular from the origin makes an angle 60° with x-axis.

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5. If p(r,c) is mid-point of a line segment between the axes, then show that $\frac{x}{r} + \frac{y}{c} = 2.$

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6. Find the equation of the line passing through the point (1,5) and also divides co-ordinate axes in the ratio 3:10.

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7. 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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8. The normal boiling point of water is $100^\circ C$ or $212^\circ F$ and the freezing point of water is $0^\circ C$ or $32^\circ F$.

Find the linear relationship between C and F.

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9. The normal boiling point of water is $100^\circ C$ or $212^\circ F$ and the freezing point of water is $0^\circ C$ or $32^\circ F$.

Find the value of C for $98.6^\circ F$

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10. The normal boiling point of water is $100^\circ C$ or $212^\circ F$ and the freezing point of water is $0^\circ C$ or $32^\circ F$.

the value of F for $38^\circ C$.

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11. An object was launched from a place P in constant speed to hit a target. At the 15^{th} second it was 1400m away from the target and the 18^{th} second 800m away. Find

the distance between the place and the target

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12. An object was launched from a place P in constant speed to hit a target. At the 15^{th} second it was 1400m away from the target and the 18^{th} second 800m away. Find

the distance covered by it in 15 seconds.

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13. An object was launched from a place P in constant speed to hit a target. At the 15^{th} second it was 1400m away from the target and the 18^{th} second 800m away. Find

time taken to hit the target.

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14. Population of a city in the years 2005 and 2010 are 1,35,000 and 1,45,000 respectively. Find the approximate population in the year 2015. (assuming that the growth of population is constant)

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15. Find the equation of the line, if the perpendicular drawn from the origin makes an angle 30° with x-axis and its length is 12.

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16. Find the equation of the straight lines passing through (8, 3) and having intercepts whose sum is 1.

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17. Show that the points (1, 3), (2, 1) and $\left(\frac{1}{2}, 4\right)$ are collinear, by using

concept of slope

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18. Show that the points (1, 3), (2, 1) and $\left(\frac{1}{2}, 4\right)$ are collinear, by using

using a straight line and

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19. Show that the points (1, 3), (2, 1) and $\left(\frac{1}{2}, 4\right)$ are collinear, by using

any other method.

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20. A straight line is passing through the point A(1,2) with slope $\frac{5}{12}$. Find points on the line which are 13 units away from A.

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21. A 150m long train is moving with constant velocity of 12.5 m/s. Find

the equation of the motion of the train,

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22. A 150m long train is moving with constant velocity of 12.5 m/s. Find

time taken to cross a pole

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23. A 150m long train is moving with constant velocity of 12.5 m/s. Find

The time taken to cross the bridge of length 850m is?

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24. A spring was hung from a hook in the ceiling. A number of different weights were attached to the spring to make it stretch, and the total length of the spring was measured each time shown in the following table.

Draw a graph showing the results.

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25. A spring was hung from a hook in the ceiling. A number of different weights were attached to the spring to make it stretch, and the total length of the spring was measured each time shown in the following table.

Find the equation relating the length of the spring to the weight on it.

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26. A spring was hung from a hook in the ceiling. A number of different weights were attached to the spring to make it stretch, and the total length of the spring was measured each time shown in the following table.

What is the actual length of the spring.

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27. A spring was hung from a hook in the ceiling. A number of different weights were attached to the spring to make it stretch, and the total length of the

spring was measured each time shown in the following table.

If the spring has to stretch to 9 cm long, how much weight should be added?

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28. A spring was hung from a hook in the ceiling. A number of different weights were attached to the spring to make it stretch, and the total length of the spring was measured each time shown in the following table.

How long will the spring be when 6 kilograms of weight on it?

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29. A family is using Liquefied petroleum gas (LPG) of weight $14.2kg$ for conumption.(Full weight $29.5kg$ includes the empty cylinders tare weight of $15.3kg$). If it is use with constant rate then it lasts for 24 days. Then the new cylinder is replaced

Q (i) Find the equation relating the quantity of gas in the cylinder to the days.

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30. In a shopping mall there is a hall of cuboid shape with dimension $800 \times 800 \times 720$ units, which needs to be added the facility of an escalator in the path as shown by the dotted line in the figure. Find

the minimum total length of the escalator.

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31. In a shopping mall there is a hall of cuboid shape with dimension $800 \times 800 \times 720$ units, which needs to be added the facility of an escalator in the path as shown by the dotted line in the figure. Find

the heights at which the escalator changes its

direction.

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32. In a shopping mall there is a hall of cuboid shape with dimension $800 \times 800 \times 720$ units, which needs to be added the facility of an escalator in the path as shown by the dotted line in the figure. Find the slopes of the escalator at the turning points.

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Exercise 6 3

1. Show that the lines are $3x+2y+9=0$ and $12x+8y-15=0$ are parallel lines.

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2. Find the equation of the straight line parallel to $5x-4y+3=0$ and having x-intercept 3.

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3. Find the distance between the line $4x+3y+4=0$ and a point (i) $(-2, 4)$ (ii) $(7, -3)$

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4. Write the equation of the lines through the point $(1,-1)$

parallel to $x+3y-4=0$

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5. Write the equation of the lines through the point $(1,-1)$

perpendicular to $3x+4y=6$

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6. If $(-4,7)$ is one vertex of a rhombus and if the equation of one diagonal is $5x-y+7=0$, then find the equation of another diagonal.

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7. Find the equation of the lines passing through the point of intersection lines $4x-y+3=0$ and $5x+2y+7=0$ through the point $(-1,2)$

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8. Find the equation of the lines passing through the point of intersection lines $4x-y+3=0$ and $5x+2y+7=0$ Parallel to $x-y+5=0$

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9. Find the equation of the lines passing through the point of intersection lines $4x-y+3=0$ and $5x+2y+7=0$ Perpendicular to $x-2y+1=0$

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10. Find the equations of two straight lines which are parallel to the line $12x+5y+2=0$ and at a unit distance from the point $(1, -1)$.

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11. Find the equations of straight lines which are perpendicular to the line $3x+4y-6=0$ and are at a distance of 4 units from $(2,1)$.

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12. Find the equation of a straight line parallel to $2x+3y=10$ and which is such that the sum of its intercepts on the axes is 15.

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13. Find the length of the perpendicular and the co-ordinates of the foot of the perpendicular from $(-10,-2)$ to the line $x+y-2=0$.

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14. If p_1 and p_2 are the lengths of the perpendiculars from the origin to the straight lines $x \sec\theta + y \operatorname{cosec}\theta = 2a$ and $x\cos\theta - y\sin\theta = a\cos 2\theta$, then prove that ${p_1}^2 + {p_2}^2 = a^2$.

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15. Find the distance between the parallel lines

12x+5y=7 and 12x+5y+7=0

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16. Find the distance between the parallel lines

$3x-4y+5=0$ and $6x-8y-15=0$

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17. Find the family of straight lines (i) Perpendicular (ii) Parallel to $3x+4y-12=0$.

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18. If the line joining two points A(2,0) and B(3,1) is rotated about A in anticlockwise direction through an

angle of 15°, then find the equation of the line in new position.

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19. A ray of light coming from the point (1,2) is reflected at a point A on the x-axis and it passes through the point (5,3). Find the co-ordinates of the point A.

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20. A line is drawn perpendicular to 5x=y+7. Find the equation of the line if the area of the triangle formed

by this line with co-ordinate axes is 10 sq. units.

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21. Find the of the image of the point (-2,3) about the line x+2y-9=0.

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22. A photocopy store charges Rs. 1.50 per copy for the first 10 copies and Rs. 1.00 per copy after the 10th copy. Let x be the number of copies, and let y be the total cost of photocopying.

Draw graph of the cost as x goes from 0 to 50 copies.

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23. A photocopy store charges Rs. 1.50 per copy for the first 10 copies and Rs. 1.00 per copy after the 10th copy. Let x be the number of copies, and let y be the total cost of photocopying.

Find the cost of making 40 copies

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24. Find atleast two equations of the straight lines in the family of the lines $y=5x+b$, for which b and the x-

coordinate of the point of intersection of the lines with $3x-4y=6$ are integers.

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25. Find all the equations of the straight lines in the family of the lines $y=mx-3$, for which m and the x - coordinate of the point of intersection of the lines with $x-y=6$ are integers.

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Exercise 6 4

1. Find the combined equation of the straight lines whose separate equations are x-2y-3=0 and x+y+5=0.

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2. Show that $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents a pair of parallel lines.

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3. Show that $2x^2 + 3xy - 2y^2 + 3x + y + 1 = 0$ represents a pair of perpendicular lines.

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4. Show that the equations $2x^2 - xy - 3y^2 - 6x + 19y - 20 = 0$ represents a pair of intersecting lines. Show further that the angle between them is $\tan^{-1}(5)$.

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5. Prove that the equations to the straight lines through the origin each of which makes an angle α with the straight line $y = x$ is $x^2 - 2xy \sec 2\alpha + y^2 = 0$.

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6. Find the equation of the pair of straight lines passing through the point (1,3) and perpendicular to the lines 2x-3y+1=0 and 5x+y-3=0.

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7. Find the separate equation of the following pair of straight lines

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

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8. Find the separate equation of the following pair of straight lines

$6(x-1)^2+5(x-1)(y-2)-4(y-2)^2=0$

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9. Find the separate equation of the following pair of straight lines

$2x^2-xy-3y^2-6x+19y-20=0$

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10. The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, show that $8h^2 = 9ab$.

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11. The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is three times the other, show that $3h^2 = 4ab$.

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12. A ΔOPQ is formed by the pair of straight lines $x^2 - 4xy + y^2 = 0$ and the line PQ. The equation of PQ is x+y-2=0. Find the equation of the median of the triangle ΔOPQ drawn from the origin O.

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13. Find p and q, if the following equation represents a pair of perpendicular lines $6x^2 + 5xy - py^2 + 7x + qy - 5 = 0.$

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14. Find the value of k if the following equation represents a pair of straight lines. Further, find whether these lines are parallel or intersecting $12x^2 + 7xy - 12y^2 - x + 7y + k = 0.$

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15. For what value of k does the equation $12x^2 + 2kxy + 2y^2 + 11x - 5y + 2 = 0$ represent two straight lines.

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16. Show that the equation $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$ represents a pair of parallel lines. Find the distance between them.

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17. Show that the equation $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents a pair of parallel lines. Find the distance between them.

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18. 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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19. Prove that the straight lines joining the origin to the points of intersection of $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y - 1 = 0$ are at right angles.

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Exercise 6 5

1. The equation of the locus of the point whose distance from y-axis is half the distance from origin is

A. $x^2 + 3y^2 = 0$

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

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

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

Answer: D

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2. Which of the following equation is the locus of $(at^2, 2at)$

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

B. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

C. $x^2 + y^2 = a^2$

D. $y^2 = 4ax$

Answer: D

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3. Which of the following point lie on the locus of $3x^2 + 3y^2 - 8x - 12y + 17 = 0$

A. (0, 0)

B. (-2, 3)

C. (1, 2)

D. (0, -1)

Answer: C

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4. If the point (8,-5) lies on the locus $\frac{x^2}{16} - \frac{y^2}{25} = k$, then the value of k is

A. 0

B. 1

C. 2

D. 3

Answer: D

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5. Straight line joining the points (2,3) and (-1,4) passes through the point (α, β) if

A. $\alpha + 2\beta = 7$

B. $3\alpha + \beta = 9$

C. $\alpha + 3\beta = 11$

D. $3\alpha + \beta = 11$

Answer: C

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6. The slope of the line which makes an angle 45 with the line 3x-y=-5 are

A. 1, -1

B. $\frac{1}{2}, -2$

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

D. $2, -\frac{1}{2}$

Answer: B

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7. Equation of the straight line forms an isosceles triangle with coordinate axes in the I-quadrant with perimeter $4 + 2\sqrt{2}$ is

A. x+y+2=0

B. x+y-2=0

C. $x + y - \sqrt{2} = 0$

D. $x + y + \sqrt{2} = 0$

Answer: B

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8. The coordinates of the four vertices of a quadrilateral are (-2,4), (-1,2) and (2,4) taken in order. The equation of the line passing through the vertex (-1,2) and dividing the quadrilateral in the equal areas is

A. $x+1=0$

B. $x+y=1$

C. $x+y+3=0$

D. $x-y+3=0$

Answer: D

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9. The intercepts of the perpendicular bisector of the line segment joining (1,2) and (3,4) with coordinate axes are

A. 5, -5

B. 5, 5

C. 5, 3

D. 5, -4

Answer: B

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10. The equation of the line with slope 2 and the length of the perpendicular from the origin equal to $\sqrt{5}$ is

A. $x + 2y = \sqrt{5}$

B. $2x + y = \sqrt{5}$

C. $2x - y = 5$

D. $x + 2y - 5 = 0$

Answer: C

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11. A line perpendicular to the line 5x-y=0 forms a triangle with the coordinate axes. If the area of the triangle is 5 sq. units, then its equation is

A. $x + 5y \pm 5\sqrt{2} = 0$

B. $x - 5y \pm 5\sqrt{2} = 0$

C. $5x + y \pm 5\sqrt{2} = 0$

D. $5x - y \pm 5\sqrt{2} = 0$

Answer: A

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12. Equation of the straight line perpendicular to the line x-y+5=0, through the point of intersection the y-axis and the given line

A. x-y-5=0

B. x+y-5=0

C. x+y+5=0

D. x+y+10=0

Answer: B

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13. If the equation of the base opposite to the vertex (2,3) of a equilateral triangle is x+y=2, then the length of a side is

A. $\sqrt{\frac{3}{2}}$

B. 6

C. $\sqrt{6}$

D. $3\sqrt{2}$

Answer: C

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14. The line $(p+2q)x+(p-3q)y=p-q$ for different values of p and q passes through the point

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

B. $\left(\frac{2}{5}, \frac{2}{5}\right)$

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

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

Answer: D

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15. The point on the line $2x-3y=5$ is equidistance from $(1,2)$ and $(3,4)$ is

A. $(7, 3)$

B. $(4, 1)$

C. $(1, -1)$

D. $(-2, 3)$

Answer: B

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16. The image of the point $(2,3)$ in the line $y = -x$ is

A. (-3, -2)

B. (-3, 2)

C. (-2, -3)

D. (3, 2)

Answer: A

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17. The length of $\perp$ from the origin to the line $\frac{x}{3} - \frac{y}{4} = 1$ is

A. $\frac{11}{5}$

B. $\frac{5}{12}$

C. $\frac{12}{5}$

D. $\frac{-5}{12}$

Answer: C

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18. The y-intercept of the straight line passing through (1,3) and perpendicular to 2x-3y+1=0 is

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

B. $\frac{9}{2}$

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

D. $\frac{2}{9}$

Answer: B

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19. If the two straight lines $x + (2k - 7)y + 3 = 0$ and $3kx + 9y - 5 = 0$ are perpendicular then the value of k is

A. k = 3

B. $k = \frac{1}{3}$

C. $k = \frac{2}{3}$

D. $k = \frac{3}{2}$

Answer: A

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20. If a vertex of a square is at the origin and its one side lies along the line $4x+3y-20=0$, then the area of the square is

A. 20 sq. units

B. 16 sq. units

C. 25 sq. units

D. 4 sq. units

Answer: B

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21. If the lines represented by the equation $6x^2 + 41xy - 7y^2 = 0$ make angle α and β with x-axis, then $\tan\alpha \tan\beta =$

A. $-\frac{6}{7}$

B. $+\frac{6}{7}$

C. $-\frac{7}{6}$

D. $\frac{7}{6}$

Answer: A

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22. The area of the triangle formed by the lines $x^2 - 4y^2 = 0$ and $x = a$ is

A. $2a^2$

B. $\frac{\sqrt{3}}{2}a^2$

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

D. $\frac{2}{\sqrt{3}}a^2$

Answer: C

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23. If one of the line given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$, then c equals to

A. -3

B. -1

C. 3

D. 1

Answer: A

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24. θ is acute angle between the lines $x^2 - xy - 6y^2 = 0$, then $\dfrac{2\cos\theta + 3\sin\theta}{4\sin\theta + 5\cos\theta}$ is

A. 1

B. $-\dfrac{1}{9}$

C. $\dfrac{5}{9}$

D. $\dfrac{1}{9}$

Answer: C

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25. The equation of one of the line represented by the equation $x^2 + 2xy\cot\theta - y^2 = 0$ is

A. $x - y\cot\theta = 0$

B. $x + y\tan\theta = 0$

C. $x\cos\theta + y(\sin\theta + 1) = 0$

D. $x\sin\theta + y(\cos\theta + 1) = 0$

Answer: D

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Additional Problems Section A

1. The value of x so that 2 is the slope of the line through (2, 5) and (x, 3) is

A. -1

B. 1

C. 0

D. 2

Answer: B

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2. If the points (a, 0) (0, b) and (x, y) are collinear, then

A. $\frac{x}{a} - \frac{y}{b} = 1$

B. $\frac{x}{a} + \frac{y}{b} = 1$

C. $\frac{x}{a} + \frac{y}{b} = -1$

D. $\frac{x}{a} + \frac{y}{b} = 0$

Answer: B

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3. Distance between the lines 5x+3y-7=0 and 15x+9y+14=0 is

A. $\frac{35}{\sqrt{34}}$

B. $\frac{1}{3\sqrt{34}}$

C. $\frac{35}{3\sqrt{34}}$

D. $\frac{35}{2\sqrt{34}}$

Answer: C

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4. The value of λ for which the lines 3x+4y=5, 5x+4y=4 and $\lambda x + 4y = 6$ meet at a point is

A. 2

B. 1

C. 4

D. 3

Answer: B

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5. Find the odd one out of the following :

A. (0, 5), (0, 7) (-7, 0)

B. (5, 0), (-9, 0) (11, 0)

C. (1, 1), (-5, -5), (-11, -11)

D. (0, -2), (-7, 0), (4, 4)

Answer: D

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Additional Problems Section B

1. Transform the equation $3x+4y+12=0$ in to normal form.

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2. Find the equation of the line perpendicular to x-axis and having intercept -2 on x-axis.

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3. Find the equation to the straight line which cuts off equal positive intercepts on the axes and their product is 25.

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4. Find the value of α and p if the equation $x\cos\alpha + y\sin\alpha = p$ is the normal form of the line $\sqrt{3x} + y + 2 = 0.$

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Additional Problems Section C

1. Find the locus of a point, so that the join of (-5, 1) and (3, 2) subtends a right angle at the moving point.

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2. 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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Additional Problems Section D

1. Find the locus of a point which divides so that the sum of its distances from (-4,0) and (4,0) is 10 units.

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2. Find the equation of the perpendicular bisector of the line segment joining the points (1, 1) and (2,3).

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3. Find the distance of the line 4x - y=0 from the point P (4,1) measured along the line making an angle 135 degree with the positive x-axis.

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