



## MATHS

# BOOKS - VIKRAM PUBLICATION ( ANDHRA PUBLICATION)

# PAIR OF STRAIGHT LINES

**Solved Problems** 

1. Does the equation  $x^2 + xy + y^2 = 0$ represent a pair of lines?

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2. Find the nature of the triangle of formed by the lines  $x^2 - 3y^2 = 0$  and x = 2.

3. Find the centroid and the area of the triangle formed by the lines

$$12x^2 - 20xy + 7y^2 = 0, 2x - 3y + 4 = 0$$

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4. Prove that the lines represented by the equations  $x^2 - 4xy + y^2 = 0$  and x + y = 3 form an equilateral triangle.

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

product of the perpendicular from the origin

6. Let  $ax^2 + 2hxy + by^2 = 0$  represent a pair of straight lines.

Then show that the equation of the pair of straight lines.

Passing through  $(x_0, y_0)$  and parallel to the given pair of lines is

$$a(x-x_0)^2+2h(x-x_0)(y-y_0)+b(y-y_0)^2=0$$



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

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**8.** Two equal sides of an isoceles triangle are given by 7x-y+3=0 and x+y-3=0 and the third side passes through the point (1,10) then slope m of the third side is given by

9. Find the angle between the straight lines represented by  $2x^2+5xy+2y^2-5x-7y+3=0$ 

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10. Find the equation of the pair of lines passing through the origin

and parallel to the pair of lines  $2x^2 + 3xy - 2y^2 - 5x + 5y - 3 = 0$ 

11. Find the equation of the pair of lines passing through the origin

and perpendicular to the pair of lines  $ax^2+2hxy+by^2+2gx+2fy+c=0$ 



12. If 
$$x^2 + xy - 2y^2 + 4x - y + k = 0$$
 represents a pair of

straight lines, find k.

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13. Prove that the equation  $2x^2 + xy - 6y^2 + 7y - 2 = 0$ 

represents a pair of straight lines.

14. Prove that the equation  $2x^2 + 3xy - 2y^2 - x + 3y - 1 = 0$ represents a pair of perpendicular straight lines.

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

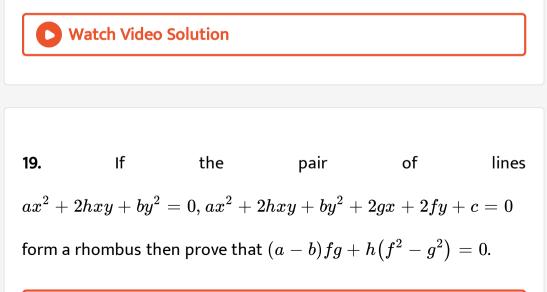
16. Find the value of  $\lambda$  for which the equation  $\lambda x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$  represents a pair of striaght lines.

17. Show that two pairs of two straight lines  $6x^2 - 5xy - 6y^2 = 0$ and  $6x^2 - 5xy - 6y^2 + x + 5y - 1 = 0$  form a square

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**18.** Show that the following equations represents a pair of parallel lines and also find the distance between them.

Show that the equation  $8x^2 - 24xy + 18y^2 - 6x + 9y - 5 = 0$ represents a pair of parallel lines and find the distance between them.





**20.** If two of the sides of a parallelogram are represented by  $ax^2 + 2hxy + by^2 = 0$  and pq + qy = 1 is one of its diagonals, prove that the other diagonal is y(bp - hq) = x(aq - hp).

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**1.** Find the acute angle between pair of lines represented by following equations.

$$x^2 - 7xy + 12y^2 = 0$$

**2.** Find the acute angle between pair of lines represented by following equations.

$$y^2 - xy - 6x^2 = 0$$

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**3.** Find the acute angle between pair of lines represented by following equations.

$$x^2+2xy\cotlpha-y^2=0$$

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**4.** Find the acute angle between pair of lines represented by following equations.

$$x^2+2xy\cotlpha-y^2=0$$

1. Show that the following pairs of lines are equally inclined to each

other.

$$2x^2+6xy+y^2=0, 4x^2+18xy+by^2=0,$$
 b=

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2. Show that the following pairs of lines are equally inclined to each

other.

$$a^2x^2+2h(a+b)xy+b^2y^2=0, ax^2+2hxy+by^2=0(a+b
eq 0)$$

3. Show that the following pairs of lines are equally inclined to each

other.

$$ax^2+2hxy+by^2+\lambdaig(x^2+y^2ig)=0,$$
  $(\lambda\in R)ax^2+2hxy+by^2=0$ 



**4.** Find the value of h if the slopes of the lines represented by  $6x^2 + 2hxy + y^2 = 0$  are in the ratio 1:2.

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5. If  $ax^2 + 2hxy + by^2 = 0$  represents two straight lines such that slope of one line is twice the slope of the other, prove that  $8h^2 = 9ab.$ 

6. Show that equation of pair of lines passing through origin and making an angle of  $30^{\circ}$  with the line  $3x - y - 1 = 0is13x^2 - 12xy - 3y^2 = 0$ 



7. Find the equation to the pair of lines passing through origin and

making an acute angle a' with the straight line x + y + 5 = 0

8. Show that the lines  $(x+2a)^2 - 3y^2 = 0, x = a$  form an equilateral triangle.



9. Show that pair of bisectors of angles between the lines  $(ax+by)^2=c(bx-ay)^2(c>0)$  are parallel and perpendicular to the line ax+by+k=0

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10. The adjacent sides of a parallelogram are  $2x^2-5xy+3y^2=0$ 

and one diagonal is x + y + 2 = 0. Find the vertices and the other

diagonal.

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11. Find the centriod and hence find the area of the triangle formed

by the following lines

$$2y^2 - xy - 6x^2 = 0x + y + 4 = 0$$

12. Find the centriod and hence find the area of the triangle formed

by the following lines

$$3x^2 - 4xy + y^2 = 0, 2x - y = 6$$

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13. Find the equation of pair of lines intersecting at (2, -1) and

Perpendicular to pair  $6x^2 - 13xy - 5y^2 = 0$ 

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14. Find the equation of pair of lines intersecting at (2, -1) and

Perpendicular to pair  $6x^2 - 13xy - 5y^2 = 0$ 

15. Find the equation of the bisector of the acute angle between

the lines 3x - 4y + 7 = 0, 12x + 5y - 2 = 0



16. Find the equation of bisector of the obtuse angle between the

lines x + y - 5 = 0 and x - 7y + 7 = 0

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Exercise 4 A lii

1. Show that the lines represented by 
$$(lx + my)^2 - 3(mx - ly)^2 = 0$$
 and  $lx + my + n = 0$  form an equilateral triangle with area  $rac{n^2}{\sqrt{3}(l^2 + m^2)}$ .

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2. Show that the straight lines represented by  $3x^2+48xy+23y^2=0, 3x-2y+13=0$  form an equilateral triangle of area  $\frac{13}{\sqrt{3}}$  sq. units

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**3.** 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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4. If one jine of the pair of lines  $ax^2 + 2hxy + by^2 = 0$  bisects the angle between the coordinate axes, then prove that  $(a+b)^2 = 4h^2$ .

5. If  $(\alpha, \beta)$  is the centroid of the triangle, whose sides are  $ax^2 + 2hxy + by^2 = 0$  and lx + my = 1, then show that  $\frac{\alpha}{bl - hm} = \frac{\beta}{am - hl} = \frac{2}{3(bl^2 - 2hlm + am^2)}$ 

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6. Prove that the distance from the origin to the orthocentre of the triangle formed by the lines  $\frac{x}{\alpha} + \frac{y}{\beta} = 1$  and  $ax^2 + 2hxy + by^2 = 0$  is  $(\alpha^2 + \beta^2)^{1/2}$  $\left| \frac{(a+b)\alpha\beta}{a\alpha^2 - 2h\alpha\beta + b\beta} \right|.$ 

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7. The straight line lx + my + n = 0 bisects and angle between the pair of lines of which one is px + qy + r = 0. Show that the other line is

$$ig(l^2m^2ig)(px+qy+r) = 2(lp+mq)(lx+my+n) = 0$$

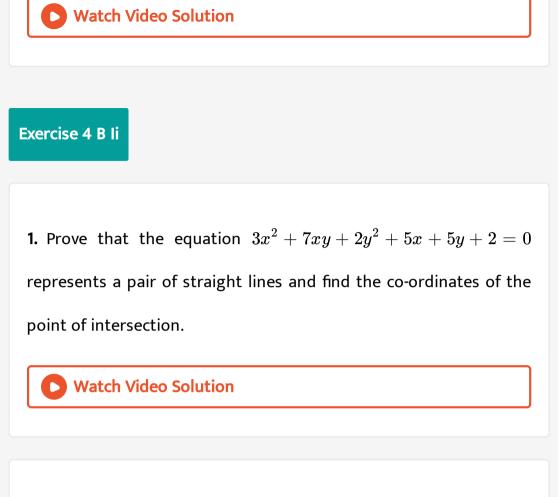
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#### Exercise 4 B I

1. Find the angle between the lines represented by  $2x^2 + xy - 6y^2 + 7y - 2 = 0.$ 

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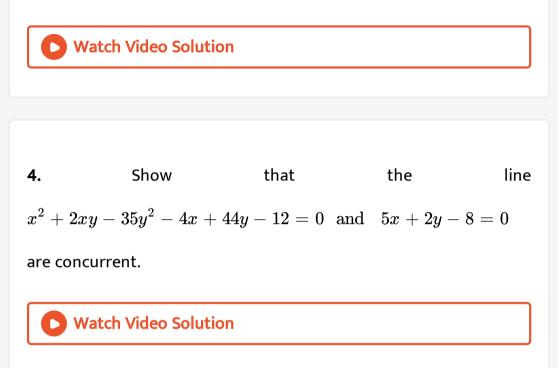
**2.** Prove that the equation  $2x^2 + 3xy - 2y^2 + 3x + y + 1 = 0$ represents a pair of perpendicular lines and find the lines.



2. Find k, if the equation  $2x^2 + kxy - 6y^2 + 3x + y + 1 = 0$ represents a pair of lines. Find the point of intersection of the lines and angle between the lines for this value of k.

**3.** Show that the equation  $x^2 - y^2 - x + 3y - 2 = 0$  represents a

pair of perpendicular lines and find their equations.



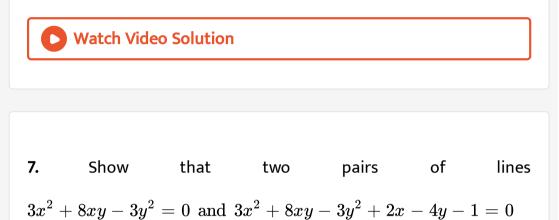
**5.** Show that the following equations represents a pair of parallel lines and also find the distance between them.

$$9x^2 - 6xy + y^2 + 18x - 6y + 8 = 0$$

6. Show that the following equations represents a pair of parallel

lines and also find the distance between them.

$$x^2+2\sqrt{3}xy+3y^2-3x-3\sqrt{3}y-4=0$$

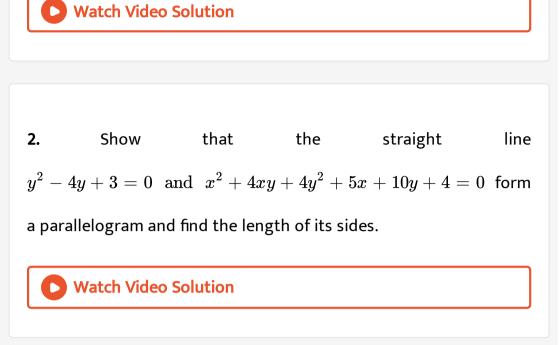


forms a square.

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#### Exercise 4 B lii

**1.** Find the product of lengths of perpendiculars drawn from (2, 1) upon the lines  $12x^2 + 25xy + 12y^2 + 10x + 11y + 2 = 0$ 



**3.** Show that product of the perpendicular distances from origin to pair of lines represented by  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$  is  $\frac{|c|}{\sqrt{(a-b)^2 + 4h^2}}$ 

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4. If the equation  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of lines, then show that the square of the distance of their point of intersection from the origin is  $\frac{c(a+b) - f^2 - g^2}{ab - h^2}$ . Also show that the square of this distance is  $\frac{f^2 + g^2}{h^2 + b^2}$  if the given lines are perpendicular.

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#### Exercise 4 C I

**1.** Find the equation of the lines joining the origin to the points of intersection of  $x^2 + y^2 = 1$  and x + y = 1.

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2. Find the angle between the lines joining the origin to the points

of intersection of  $y^2 = x$  and x + y = 1.

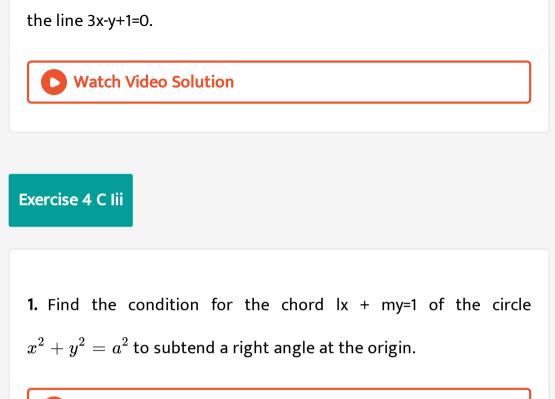
1. Show that the lines joining the origin to the points of intersection of the curve  $x^2 + xy + y^2 + 3x + 3y - 2 = 0$  and the straight line  $x - y - \sqrt{2} = 0$  are mutually perpendicular .

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

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**3.** Find the angle between the lines joining the origin to the points of intersection of the curve  $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$  and



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

**3.** Write down the equation of the pair of straight lines joining the origin to the points of intersection of the 6x - y + 8 = 0 with the pair of straight lines  $3x^2 + 4xy - 4y^2 - 11x + 2y + 6 = 0$ . Show that the lines so obtained make equal angles with the coordinates axes.

