MATHS

JEE (MAIN AND ADVANCED) MATHEMATICS

SYSTEM OF CIRCLES

Example

1. Find the angle between the circles given by the equations.

$x^2 + y^2 + 6x - 10y - 135 = 0,$

$x^2 + y^2 - 4x - 116 = 0$

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2. The points A(2, 3) and B(-7, -12) are conjugate points w.r.t to the circle $x^2 + y^2 - 6x - 8y - 1 = 0$. The centre of the circle passing through A

and B and orthogonal to given circle is

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3. Find the angle between the circles given by the equations $x^2 + y^2 + 6x - 10y - 135 = 0, x^2 + y^2 - 4x + 14y - 116 = 0$

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4. Find k if the cirlces $x^2 + y^2 - 5x - 14y - 34 = 0$ and $x^2 + y^2 + 2x + 4y + k = 0$ are orthogonal to each other.

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Solved Examples

1. If the the angle between the circles

$x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + kx + 6y - 59 = 0$ is 45°

find k.

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2. Find the equation of the circle which passes through the point (0,-3) and intersect the circles given by the equations $x^2 + y^2 - 6x + 3y + 5 = 0$ and $x^2 + y^2 - x - 7y = 0$ orthogonally .

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3. If P and Q are conjugate points w.r.t a circle $S = x^2 + y^2 + 2gx + 2fy + c = 0$, then prove that the circle PQ as diameter cuts the circles S=0 orthogonallly.

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4. If the equations of two circles whose radii are a and a' are S=0 and S'=0 , then show that the circles $\frac{S}{a} + \frac{S'}{a'} = 0$ and $\frac{S}{a} - \frac{S'}{a'} = 0$ intersect

orthogonally.

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5. Find the equation of the radical axis of the circles represented by $2x^2 + 2y^2 + 3x + 6y - 5 = 0$ and $3x^2 + 3y^2 - 7x + 8y - 11 = 0$

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6. Find the radical centre of the following circles.

$x^2 + y^2 + 4x - 7 = 0, 2x^2 + 3y^2 + 3x + 5y - 9 = 0, x^2 + y^2 + y = 0.$

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7. Show that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ is the diameter of the second circle and also find its length.

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8. Prove that the radical axis of the circles $x^2 + y^2 + 2gx + 2fy + c = 0$ and $x^2 + y^2 + 2g'x + 2f'y + c' = 0$ is the diameter of the later circle (or the former bisects the circumference of the later) if 2g'(g-g')+2f'(f-f')=c-c'

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9. If the straight line represented by x cos α + y sin α = p intersect the circle $x^2 + y^2 = a^2$ at the points A and B , then show that the equation of the circle with AB as diameter is $(x^2 + y^2 - a^2) - 2p(x\cos\alpha + y\sin\alpha - p) = 0$

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10. Find the equation of the circle passing through the intersection of the circles $x^2 + y^2 = 2ax, x^2 + y^2 = 2by$ and having its centre on the line $\frac{x}{a} - \frac{y}{b} = 2.$

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11. Find the equation of the circle which cuts the circles $x^2 + y^2 + 4x + 2y + 1 = 0, 2\left(x^2 + y^2\right) + 8x + 6y - 3 = 0$ and $x^2 + y^2 + 6x - 2y - 3 = 0$ orthogonally.

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12. If the the angle between the circles $x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + kx + 6y - 59 = 0$ is 45° find k.

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13. Find the equation of the circle which passes through the point (0,-3) and intersect the circles given by the equations $x^2 + y^2 - 6x + 3y + 5 = 0$ and $x^2 + y^2 - x - 7y = 0$ orthogonally .

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14. If P and Q are conjugate points w.r.t a circle $S = x^2 + y^2 + 2gx + 2fy + c = 0$, then prove that the circle PQ as diameter cuts the circles S=0 orthogonallly.

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15. If the equations of two circles whose radii are a and a' are S=0 and S'=0 , then show that the circles $\frac{S}{a} + \frac{S'}{a'} = 0$ and $\frac{S}{a} - \frac{S'}{a'} = 0$ intersect orthogonally.

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16. Find the equation of the cirlcle which cuts orthogonally the three circles $x^2 + y^2 + 2x + 4y + 1 = 0, 2\left(x^2 + y^2\right) + 6x + 8y - 3 = 0$ and $x^2 + y^2 - 2x + 6y - 3 = 0$

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17. Find the equation of the circle passing through the intersection of the circles $x^2 + y^2 = 2ax, x^2 + y^2 = 2by$ and having its centre on the line $\frac{x}{a} - \frac{y}{b} = 2.$

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18. If the straight line represented by x cos α + y sin α = p intersect the circle $x^2 + y^2 = a^2$ at the points A and B , then show that the equation of the circle with AB as diameter is $\left(x^2 + y^2 - a^2\right) - 2p(x\cos\alpha + y\sin\alpha - p) = 0$

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19. Find the equations of the circles which cut orthogonally the circles $x^2 + y^2 - 6y + 1 = 0, x^2 + y^2 - 4y + 1 = 0$ and touch the line $3x + 4y + 5 = 0$

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20. Find the equation of the radical axis of the circles represented by $2x^2 + 2y^2 + 3x + 6y - 5 = 0$ and $3x^2 + 3y^2 - 7x + 8y - 11 = 0$

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21. if the two circles

$x^2 + y^2 + 2gx + 2fy = 0$ and

$x^2 + y^2 + 2g'x + 2f'y = 0$touch each other then show that f'g = fg'

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22. Find the radical centre of the circles

$x^2 + y^2 + 4x = 7 = 0, 2x^2 + 2y^2 + 3x + 5y - 9 = 0$ and

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

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23. Show that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ is the diameter of the second circle and also find its length.

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24. Prove that the radical axis of the circles $x^2 + y^2 + 2gx + 2fy + c = 0$ and $x^2 + y^2 + 2g'x + 2f'y + c' = 0$ is the diameter of the later circle (or the former bisects the circumference of the later) if 2g'(g-g')+2f'(f-f')=c-c'

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25. Find the equation of the circle which cuts the circles $x^2 + y^2 + 4x + 2y + 1 = 0, 2(x^2 + y^2) + 8x + 6y - 3 = 0$ and $x^2 + y^2 + 6x - 2y - 3 = 0$ orthogonally.

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Additional Solved Examples

1. Find the equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ and having the centre at (-1,2).

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2. Find the equations of the circles which cut orthogonally the circles $x^2 + y^2 - 6y + 1 = 0, x^2 + y^2 - 4y + 1 = 0$ and touch the line $3x + 4y + 5 = 0$

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3. Find the equation of the circle passing through the points of intersections of circles $x^2 + y^2 + 6x + 4y - 12 = 0, x^2 + y^2 - 4x - 6y - 12 = 0,$ and having radius $\sqrt{13}.$

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4. Find radical centre of three circles discribed on the three sides $4x - 7y + 10 = 0, x + y - 5 = 0$ and 7x+4y-15=0 of triangle as diameters .

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5. The circles having radii 1,2,3 touch each other externally then find the radius of the circle which cuts the three circles orthogonally.

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6. Find the length of the common chord of the circle $x^2 + y^2 + 2hx + a^2 = 0$ and $x^2 + y^2 - 2ky - a^2 = 0.$

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7. Two circles are drawn through the points (1,5) and (4,1) to touch the axis of y. Find the angle at which they intersect.

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8. If a circle passes through the point (a,b) and cuts $x^2 + y^2 = k^2$ orthogonally then find the equation of the locus of its centre .

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Exercise 2 1 Short Answer

1. Find the angle between the circles given by the equations.

$x^2 + y^2 - 12x - 6y + 41 = 0,$

$x^2 + y^2 + 4x + 6y - 59 = 0.$

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2. Find the angle between the circles

$x^2 + y^2 + 4x - 14y + 28 = 0$ and

$x^2 + y^2 + 4x - 5 = 0$

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3. Show that the angle between the circles

$x^2 + y^2 = a^2, x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$

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4. Show that the circles given by the following equations intersect each other orthogonally .

$x^2 + y^2 + 2my - g = 0$

$x^2 + y^2 - 2lx + g = 0$

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5. Show that the circles given by the following equation intersect each other orthogonally.

$x^2 + y^2 - 2x - 2y - 7 = 0,$

$3x^2 + 3y^2 - 8x + 29y = 0.$

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6. Show that the circles given by the following equations intersect each other orthogonally .

$x^2 + y^2 + 4x - 2y - 11 = 0$

$x^2 + y^2 - 4x - 8y + 11 = 0$

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7. Show that the circles given by the following equation intersect each other orthogonally.

$x^2 + y^2 - 2x + 4y + 4 = 0,$

$x^2 + y^2 + 3x + 4y + 1 = 0.$

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8. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 + 2by - k = 0$

$x^2 + y^2 + 2ax + 8 = 0$

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9. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 - 6x - 8y + 12 = 0$

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

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10. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 - 16y - k = 0$

$x^2 + y^2 + 4x - 8 = 0$

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11. Find the equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having the centre at (2,3)

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Exercise 2 1 Long Answer

1. Find the equation of the circle which passes through the origin and intersects each of the following circles orthogonally.

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

$x^2 + y^2 - 8y + 12 = 0$

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2. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 - 6x - 8y + 12 = 0$

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

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3. Find the equation of the circle which passes through (1,1) and cuts orthogonally each of the circles $x^2 + y^2 - 8x - 2y + 16 = 0$ and $x^2 + y^2 - 4x - 4y - 1 = 0$

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4. Find the equation of the circle which passes through the points (2,0) (0,2) and orthogonal to the circle $2x^2 + 2y^2 + 5x - 6y + 4 = 0$.

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5. Find the equation of the circle passing through the origin, having its centre on the line x+y=4 and intersecting the circle $x^2 + y^2 - 4x + 2y + 4 = 0$ orthogonally.

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6. Find the equation of the circle which cuts the circles $x^2 + y^2 - 4x - 6y + 11 = 0$ and $x^2 + y^2 - 10x - 4y + 21 = 0$ orthogonally and has the diameter along the line 2x+3y=7.

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7. Find the equation of circle which intersect the circle $x^2 + y^2 - 6x + 4y - 3 = 0$ orthogonally and passes through the point (3,0) and touches Y-axis.

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Exercise 2 2 Very Short Answer

1. Find the equation of the radical axis of the following circles.

$x^2 + y^2 - 2x - 4y - 1 = 0$

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

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2. Find the equation of the radical axis of the following circles.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$x^2 + y^2 + 4x + y = 0$

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3. Find the equation of the radical axis of the following circles.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$x^2 + y^2 + 4x + y = 0$

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4. Find the equation of the radical axis of the following circles.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$x^2 + y^2 + 4x + y = 0$

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5. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 + 2x + 3y + 1 = 0$

$x^2 + y^2 + 4x + 3y + 2 = 0$

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6. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 + 2x + 3y + 1 = 0$

$x^2 + y^2 + 4x + 3y + 2 = 0$

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7. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 - 4x - 4y + 3 = 0$

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

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8. Find the equation of the common tangent of the following circles at their point of contact.

$x^2 + y^2 + 10x - 2y + 22 = 0$

$x^2 + y^2 + 2x - 8y + 8 = 0$

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9. Find the equation of the common tangent of the following circles at their point of contact.

$x^2 + y^2 - 8y - 4 = 0$

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

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Exercise 2 2 Short Answer

1. Find the radical centre of the following circles

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

$x^2 + y^2 - 2x - 4y - 1 = 0$

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

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2. Find the radical centre of the following circles

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

$x^2 + y^2 - 2x - 4y - 1 = 0$

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

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3. The length of the common chord of the circles $x^2 + y^2 + ax + by + c = 0$ and $x^2 + y^2 + bx + ay + c = 0$ is

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4. Find the equation and length of the common chord of the two circles $S = x^2 + y^2 + 3x + 5y + 4 = 0$ and $S = x^2 + y^2 + 5x + 3y + 4 = 0$

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5. Find the equation and length of the common chord of the following circles.

$x^2 + y^2 + 2x + 2y + 1 = 0,$

$x^2 + y^2 + 4x + 3y + 2 = 0.$

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Exercise 2 2 Long Answer

1. If the straight line 2x+3y=1 intersects the circle $x^2 + y^2 = 4$ at the points A and B then find the equation of the circle having AB as diameter.

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2. If x+y=3 is the equation of the chord AB of the circle $x^2 + y^2 - 2x + 4y - 8 = 0$, find the equation of the circle having as diameter.

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3. Find the equation of the circle whose diameter is the common chord of the circles $x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$

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4. Show that the equation of the line passsing through the points of intersection of the circles $3x^2 + 3y^2 - 2x + 12y - 9 = 0$ and $x^2 + y^2 + 6x + 2y - 15 = 0$ is $10x - 3y - 18 = 0$

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5. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 3x + 2y + 1 = 0$

$x^2 + y^2 - x + 6y + 5 = 0$

$x^2 + y^2 + 5x - 8y + 15 = 0$

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6. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$2x^2 + 2y^2 + 6x + 8y - 3 = 0$

$x^2 + y^2 - 2x + 6y - 3 = 0$

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7. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 2x + 17y + 4 = 0$

$x^2 + y^2 + 7x + 6y + 11 = 0$

$x^2 + y^2 - x + 22y + 3 = 0$

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Additional Exercise

1. Show that the area of the triangle formed by the common chord of two circles $S = x^2 + y^2 - 2x + 4y - 11 = 0$ and $S' \equiv x^2 + y^2 + 4x - 6y + 4 = 0$ and the coordinate axes is $\frac{15}{8}$ sq. units.

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2. Show that the condition that the circle $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$ bisects the circumference of the circle

$x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0$ is

$2(g_1 - g_2)g_2 + 2(f_1 - f_2)f_2 = c_1 - c_2$

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3. Show that the circle $x^2 + y^2 + 4x + 4y - 1 = 0$ bisects the circumference of the circle $x^2 + y^2 + 2x - 3 = 0$.

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4. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$2x^2 + 2y^2 + 6x + 8y - 3 = 0$

$x^2 + y^2 - 2x + 6y - 3 = 0$

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5. If a circle passes through (1,2) and cuts $x^2 + y^2 = 4$ orthogonally then show that the equation of the locus of centre is 2x+4y-9=0

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6. Show that the equation of the circles passing through (1,1) and the points of intersection of the circles $x^2 + y^2 + 13x - 3y = 0$ and $2x^2 + 2y^2 + 4x - 7y - 25 = 0$ is $4x^2 + 4y^2 + 30x - 13y - 25 = 0$

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7. If a circle passes through the point (a,b) and cuts the circle $x^2 + y^2 = k^2$ orthogonally , show that the locus of its centre is $2ax + 2by - \left(a^2 + b^2 + k^2\right) = 0$

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8. If the circles $x^2 + y^2 + 2x + 2ky + 6 = 0$ and $x^2 + y^2 + 2ky + k = 0$ intersect orthogonally, show that k=2 or -3/2

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9. Show that the distance of the centre of the circle $x^2 + y^2 = 2x$ from the common chord of the circles $x^2 + y^2 + 5x - 8y + 1 = 0$ and $x^2 + y^2 - 3x + 7y - 25 = 0$ is 2.

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10. If the circles $x^2 + y^2 + 2ax + cy + a = 0$ and $x^2 + y^2 - 3ax + dy - 1 = 0$ intersect in two distinct points P and Q then show that the line 5x+6y-a=0 passes through P and Q for no value of a.

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11. Circles of radii 3,4,5 touch each other externally . Let P be the point of intersection of tangents of these circles at their points of contact .Show that the distance of P from a point of contact is $\sqrt{5}$.

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12. Three circles touch each other externally. The tangents at their points of contact meet at a point whose distance from a point of contact is 4. Show that the ratio of the product of the radii of the sum of the radii of the circles is 16.

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13. Show that the equation of the line passsing through the points of intersection of the circles $3x^2 + 3y^2 - 2x + 12y - 9 = 0$ and $x^2 + y^2 + 6x + 2y - 15 = 0$ is $10x - 3y - 18 = 0$

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14. Two circles $x^2 + y^2 = 6$ and $x^2 + y^2 - 6x + 8 = 0$ are given. Show that the equation of the circle through their points of intersection and the point (1,1) is $x^2 + y^2 - 3x + 1 = 0$

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15. A circle C of radius unity lies in the first quadrant and touches both the coordinate axes. Show that the radius of the circle which touches both coordinate axes , lies in the first quadrant and cuts C orthogonally is $2 \pm \sqrt{3}$.

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16. From a point A(3,2) , tangents are drawn to the circle $x^2 + y^2 - 2x + 4y - 4 = 0$. If BC is the chord of contact of tangents , show that the line joining the midpoints of AB and AC is 4x+8y-17=0

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17. Show that the locus of the centres of the circles passing through the points of intersections of the circles $x^2 + y^2 = 1$ and $x^2 + y^2 - 2x + y = 0$ is $x + 2y = 0$

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18. Show that the equation of the circle which passes through the point (-1,7) and which touches the straight line x=y at (1,1) is $x^2 + y^2 + 3x - 7y + 2 = 0$

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Exercise I Class Work

1. If radii of two circles are 4 and 3 and distance between centres is $\sqrt{37}$, then angle between the circles is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C

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2. The angle between the circles $x^2 + y^2 - 2x - 4y + 3 = 0$ and $x^2 + y^2 - 4x - 6y + 11 = 0$ is

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

B. $\frac{\pi}{6}$

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

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

Answer: A

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3. The angle between two circles , each passing through the centre of the other is

A. $\frac{\pi}{6}$

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

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

D. π

Answer: C

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4. The angle between the circles $x^2 + y^2 - 2x - 4y + 3 = 0$ and $x^2 + y^2 - 4x - 6y + 11 = 0$ is

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

B. $\frac{\pi}{6}$

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

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

Answer: D

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5. If the circles of same radii and with centres (2,3),(5,6) cut orthogonally then radius is

A. 3

B. 5

C. 6

D. 2

Answer: A

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6. The circle with centres (2,3) and intersecting $x^2 + y^2 - 4x + 2y - 7 = 0$ orthogonally has the radius

A. 1

B. 2

C. 3

D. 4

Answer: B

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7. If the circles $x^2 + y^2 + 2x + 2ky + 6 = 0$ and $x^2 + y^2 + 2ky + k = 0$ intersect orthogonally, show that k=2 or -3/2

A. 4

B. 3

C. 2

D. 1

Answer: D

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8. The locus of centres of the circles which cut the circles $x^2 + y^2 + 4x - 6y + 9 = 0, x^2 + y^2 - 5x + 4y + 2 = 0$ orthogonally is

A. 8x+12y-5=0

B. 8x-12y+5=0

C. 4x-6y+5=0

D. 4x-6y+3=0

Answer: B

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9. The circles $x^2+y^2-6x-8y+12=0, x^2+y^2-4x+6y+k=0$, cut orthogonally then k=

A. 3x+4y-5=0

B. 9x-10y+7=0

C. 9x+10y-7=0

D. 9x-10y+11=0

Answer: B

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10. The equation of the radical axis of the pair of circles $7x^2+7y^2-7x+14y+18=0$ and $4x^2+4y^2-7x+8y+20=0$

A. x-2y-5=0

B. 21x-68=0

C. 2x-y+5=0

D. 23x-68=0

Answer: B

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11. The common tangent at the point of contact of the two circles $x^2 + y^2 - 2x - 4y - 20 = 0, x^2 + y^2 + 6x + 2y - 90 = 0$ is

A. 4x+3y+35=0

B. 3x+4y+35=0

C. 4x+3y-35=0

D. 4x-2y-110 =0

Answer: C

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12. The distance from origin to the radical axis of the circles $x^2 + y^2 - 3x + 2y - 4 = 0, x^2 + y^2 + x - y + 1 = 0$ is

A. 3

B. 1

C. 4

D. 2

Answer: B

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13. Area of the triangle formed by the radical axis of the circles $x^2 + y^2 = 4, x^2 + y^2 + 2x + 4y - 6 = 0$ with co-ordinate axes is

A. 1/4 sq. units

B. 1/3 sq. unit

C. 1/6 sq. units

D. 1/8 sq.units

Answer: A

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14. The circle orthogonal to the three circles $x^2 + y^2 + a_i x + b_i y + c = 0$, (i=1,2,3) is

A. $x^2 + y^2 - b_i x - a_i y - c = 0$

B. $x^2 + y^2 = c$

C. $x^2 + y^2 = a_i + b_i$

D. $x^2 + y^2 = a_i$

Answer: B

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15. The equation of the circle which cuts the three circles $x^2+y^2-4x-6y+4=0, x^2+y^2-2x-8y+4=0, x^2+y^2-6x-6$ orthogonally is

A. $x^2+y^2=4$

B. $x^2+y^2=2$

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

D. $x^2+y^2=8$

Answer: A

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16. The length of the common chord of two circles of radii r_1 and r_2 which intersect at right angles is

A. $\frac{r_1 r_2}{\sqrt{r_1^2+r_2^2}}$

B. $\frac{2r_1r_2}{\sqrt{r_1^2+r_2^2}}$

C. $\frac{r_1+r_2}{\sqrt{r_1^2+r_2^2}}$

D. $\frac{r_1r_2}{r_1^2+r_2^2}$

Answer: B

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17. The length of the common chord of the circles of radii 15 and 20 whose centres are 25 units apart is

A. 24

B. 25

C. 15

D. 20

Answer: A

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18. The length of the common chord of $x^2 + y^2 + 2hx = 0, x^2 + y^2 - 2ky = 0$ is

A. $\frac{hk}{\sqrt{h^2 - k^2}}$

B. $\frac{2hk}{\sqrt{h^2 + k^2}}$

C. $\frac{hk}{h^2 + k^2}$

D. $\frac{2hk}{h^2 + k^2}$

Answer: B

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19. The equation of the circle passing through (1,2) and the points of intersection of the circles $x^2 + y^2 - 8x - 6y + 21 = 0$ and $x^2 + y^2 - 2x - 15 = 0$ is

A. $x^2 + y^2 + 6x - 2y + 9 = 0$

B. $x^2 + y^2 - 6x - 4y + 9 = 0$

C. $x^2 + y^2 - 6x - 4y + 9 = 0$

D. $x^2 + y^2 - 6x + 4y + 9 = 0$

Answer: C

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20. The length of the common chord of the two circles $(x - a)^2 + y^2 = a^2$ and $x^2 + (y - b)^2 = b^2$ is

A. $\frac{ab}{\sqrt{a^2 + b^2}}$

B. $\frac{2ab}{\sqrt{a^2 + b^2}}$

C. $\frac{a + b}{\sqrt{a^2 + b^2}}$

D. $\sqrt{a^2 + b^2}$

Answer: B

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Exercise Ii Class Work

1. If the angle between the two equal circles with centres (-2,0),(2,3) is 120° then the radius of the circle is

A. 5

B. 3

C. 1

D. 2

Answer: A

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2. The point (3,-4) lies on both the circles $x^2 + y^2 - 2x + 8y + 13 = 0$ and $x^2 + y^2 - 4x + 6y + 11 = 0$. Then the angle between the circles is

A. 60°

B. 30°

C. 120°

D. 135°

Answer: D

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3. If a circle passes through (1,2) and cuts $x^2 + y^2 = 4$, orthogonally then the locus of the centre is

A. 2x+4y-9=0

B. x+y+3=0

C. x+y-9=0

D. 2x+3y=7

Answer: A

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4. If a circle passes through the point (a,b) and cuts the circle $x^2 + y^2 = k^2$ orthogonally then the locus of its centre is

A. $2ax + 2by = a^2 + b^2 + k^2$

B. $ax + by = a^2 + b^2 + k^2$

C. $x^2 + y^2 + 2ax + 2by + k^2 = 0$

D. $x^2 + y^2 - 2ax + 2by + k^2 = 0$

Answer: A

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5. The equation of the circle which pass through the origin and cuts orthogonally each of the circles $x^2 + y^2 - 6x + 8 = 0$ and $x^2 + y^2 - 2x - 2y = 7$ is

A. $3x^2 + 3y^2 - 8x - 13y = 0$

B. $3x^2 + 3y^2 - 8x + 29y = 0$

C. $3x^2 + 3y^2 + 8x + 29y = 0$

D. $3x^2 + 3y^2 - 8x - 29y = 0$

Answer: B

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6. If the circle $x^2 + y^2 + 8x - 4y + c = 0$ touches the circle $x^2 + y^2 + 2x + 4y - 11 = 0$ externally and cuts the circle $x^2 + y^2 - 6x + 8y + k = 0$ orthogonally then k =

A. 59

B. -59

C. 19

D. -19

Answer: B

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7. The circle passing through (1,1) and cutting the two circles $x^2 + y^2 - 4x - 2y - 4 = 0, x^2 + y^2 - 2x - 4y - 4 = 0$ othogonally is

A. $x^2 + y^2 + 6x + 6y - 14 = 0$

B. $x^2 + y^2 - 3x - 3y - 7 = 0$

C. $x^2 + y^2 - 7x + 14y - 5 = 0$

D. $x^2 + y^2 - x - 6y = 0$

Answer: A

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8. The circle through the two points (-2,5),(0,0) and intersecting $x^2 + y^2 - 4x + 3y - 1 = 0$ orthogonally is

A. $2x^2 + 2y^2 - 11x - 16y = 0$

B. $x^2 + y^2 - 4x - 4y = 0$

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

D. $2x^2 + 2y^2 + 2x - 5y + 1 = 0$

Answer: A

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9. A circle passes through origin and has its centre on y = x. If it cuts $x^2 + y^2 - 4x - 6y + 10 = 0$ orthogonally then the equation of the circle is

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

B. $x^2 + y^2 - 6x - 4y = 0$

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

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

Answer: C

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10. (1, 2) is a point on the circle $x^2 + y^2 + 2x - 6y + 5 = 0$ which is orthogonal to $x^2 + y^2 = 5$. The conjugate point of (1, 2) w.r.t the circle $x^2 + y^2 = 5$ and which lies on the first circle is

A. (7,-1)

B. (9,-2)

C. (-3,4)

D. (0,5)

Answer: C

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11. The points A(2, 3) and B(-7, -12) are conjugate points w.r.t to the circle $x^2 + y^2 - 6x - 8y - 1 = 0$. The centre of the circle passing through A and B and orthogonal to given circle is

A. (-5,-9)

B. (-9,-15)

C. $\left(-\frac{5}{2}, -\frac{9}{2}\right)$

D. $\left(\frac{1}{2}, \frac{3}{2}\right)$

Answer: C

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12. The locus of centres of all circles which touch the line x = 2a and cut the circle $x^2 + y^2 = a^2$ orthogonally is

A. $y^2 + 4ax - 5a^2 = 0$

B. $y^2 + 4ax + 5a^2 = 0$

C. $y^2 = 4ax + 5a^2$

D. $y^2 = 4ax - 5a^2$

Answer: A

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13. If the circles of same radius 'a' and centres at (2, 3) and (5, 6) cut orthogonally, then a =

A. 3

B. 4

C. 6

D. 10

Answer: B

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14. If the circle $x^2 + y^2 + 2x - 2y + 4 = 0$ cuts the circle $x^2 + y^2 + 4x - 2fy + 2 = 0$ orthogonally, then f =

A. 1

B. 2

C. -1

D. -2

Answer: C

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15. A line 'l' meets the circle $x^2 + y^2 = 61$ in A, B and P(-5, 6) is such that PA = PB = 10. Then the equation of 'l' is

A. 5x+6y+11=0

B. 5x-6y-11=0

C. 5x-6y+11=0

D. 5x-6y+12=0

Answer: C

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16. If P and Q are the Points of intersection of the circles $x^2 + y^2 + 3x + 7y - 2p - 5 = 0$ and $x^2 + y^2 + 2x + 2y - p^2 = 0$ then there is a circle passing through P, Q and (1, 1) for

A. all except one value of P

B. all except two values of P

C. exactly one value of P

D. all values of P

Answer: A

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17. From the point P(2, 3) tangents PA,PB are drawn to the circle $x^2 + y^2 - 6x + 8y - 1 = 0$. The equation to the line joining the mid points of PA and PB is

A. x-7y+7=0

B. x+7y-5=0

C. x+7y+5=0

D. x-7y+5=0

Answer: A

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18. The common chord of $x^2 + y^2 - 4x - 4y = 0$ and $x^2 + y^2 = 16$ substends at the origin an angle equal to

A. $\frac{\pi}{6}$

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

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

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

Answer: D

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19. $x^2 + y^2 + 2\lambda x + 5 = 0$ and $x^2 + y^2 + 2\lambda y + 5 = 0$ are two circles. P is a point on the line x-y=0. If PA and PB are the lengths of the tangents from P to the two cricles and PA=3, then PB=

A. 1

B. 3

C. 8

D. 5

Answer: B

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20. The centres of the circles are (a, c) and (b, c) and their radical axis is y-axis. The radius of one of the circles is r. The radius of the other circle is

A. $r^2 - a^2 + b^2$

B. $2\left(r^2 - a^2 + b^2\right)$

C. $\sqrt{r^2 - a^2 + b^2}$

D. $2\sqrt{r^2 - a^2 + b^2}$

Answer: C

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21. (a,0) and (b, 0) are centres of two circles belonging to a co-axial system of which y-axis is the radical axis. If radius of one of the circles 'r', then the radius of the other circle is

A. $\left(r^2 + b^2 + a^2\right)^{1/2}$

B. $\left(r^2+b^2-a^2\right)^{1/2}$

C. $\left(r^2+b^2-a^2\right)^{1/3}$

D. $\left(r^2+b^2+a^2\right)^{1/3}$

Answer: B

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22. If the circles $x^2+y^2+2ax+cy+a=0$ and $x^2+y^2-3ax+dy-1=0$ intersect in two distinct points P and Q then the line 5x + by - a = 0 passes through P and Q for

A. exactly one value of 'a'

B. no value of 'a'

C. infinitely many values of 'a'

D. exactly two values of 'a'

Answer: B

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23. The radical centre of the circles $x^2 + y^2 - x + 3y - 3 = 0, x^2 + y^2 - 2x + 2y - 2 = 0, x^2 + y^2 + 2x + 3y$

A. (2,-1)

B. (2,3)

C. (-2,-1)

D. (-2,-3)

Answer: A

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24. The centre of the circle orthogonal to the circles $x^2 + y^2 + 4y + 1 = 0, x^2 + y^2 + 6x + y - 8 = 0, x^2 + y^2 - 4x - 4y + 37$ is

A. (1,1)

B. (2,2)

C. (3,3)

D. (0,0)

Answer: C

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25. The point from which the tangents to the circles $x^2 + y^2 - 8x + 40 = 0, 5x^2 + 5y^2 - 25x + 80 = 0$ and $x^2 + y^2 - 8x + 16y + 160 = 0$ are equal in length is

A. $\left(8, \frac{-15}{2}\right)$

B. $\left(-8, \frac{15}{2}\right)$

C. $\left(8, \frac{15}{2}\right)$

D. $\left(-8, \frac{-15}{2}\right)$

Answer: A

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26. You are given $n(\geq 3)$ circles having different radical axes and radical centres. The value of 'n' for which the number of radical axes is equal to the number of radical centres is

A. 3

B. 4

C. 5

D. 8

Answer: C

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27. If A, B, C are the centres of three circles touching mutually externally then the radical centre of the circles for $\triangle ABC$ is

A. centroid

B. orthocentre

C. circum centre

D. incentre

Answer: D

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28. The radical centre of the three circles described on the three sides of a triangle as diameter is ..... of the triangle

A. centroid

B. orthocentre

C. circum centre

D. incentre

Answer: B

Watch Video Solution

29. ABC is a triangle. The radical centre of the circles with AB, BC, CA as the diameters is (-6, 5). If A(3, 2), B(2, 1) then C =

A. (1,1)

B. (1,2)

C. (2,3)

D. (1,-2)

Answer: D

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30. A, B, C are the centres of three circles of equal radii which donot touch extranally pairwise whose centers are non-collinear. The radical centre of the circles for triangle ABC is

A. circumcentre

B. centroid

C. orthocentre

D. incentre

Answer: A

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31. A,B,C are the centres of the three circles C_1, C_2, C_3 such that C_1, C_2 touch each other exernally and they both touch C_3 from inside then the radical centre of the circles is for triangle ABC is

A. incentre

B. Excentre opposite to C

C. Excentre opposite to B

D. Excentre opposite to A

Answer: B

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32. The slope of the radical axis of the circles $x^2 + y^2 + 3x + 4y - 5 = 0$ and $x^2 + y^2 - 5x + 5y + 6 = 0$ is

A. 1

B. 2

C. 5

D. 8

Answer: D

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33. The distance of the point (1,-2) from the common chord of the circles

$x^2 + y^2 - 5x + 4y - 2 = 0$ and $x^2 + y^2 - 2x + 8y + 3 = 0$

A. 2

B. 4

C. $1/2$

D. 0

Answer: D

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34. The length of the common chord of the circles

$x^2 + y^2 + 2x + 3y + 1 = 0, x^2 + y^2 + 4x + 3y + 2 = 0$ is

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. 4

Answer: C

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35. The length of the common chord of the circles $(x-6)^2+(y-4)^2=4, (x-4)^2+(y-6)^2=4$ is

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. $4\sqrt{2}$

D. $6\sqrt{2}$

Answer: B

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36. If the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ bisects the circumference of the circle

$x^2 + y^2 + 2g'x + 2f'y + c' = 0$, them the length of the common chord of these two circles is

A. $2\sqrt{g^2 + f^2 - c}$

B. $2\sqrt{g^{|2} + f^{|2} - c^1}$

C. $2\sqrt{g^2 + f^2 + c}$

D. $2\sqrt{g^{|2} + f^{|2} + c^|}$

Answer: B

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37. The condition that the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ to bisect the circumference of the circle $x^2 + y^2 + 2g^1x + 2f^1y + c^1 = 0$ is

A. 16

B. 24

C. -42

D. -62

Answer: D

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38. The length of the common chord of the two circles $(x-a)^2+(y-b)^2=c^2, (x-b)^2+(y-a)^2=c^2$ is

A. $\sqrt{4c^2+2(a-b)^2}$

B. $\sqrt{4c^2+2(a+b)^2}$

C. $\sqrt{4c^2-2(a-b)^2}$

D. $\sqrt{c^2-(a-b)^2}$

Answer: C

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39. The circle on the chord xcos α + ysin α =p of the circle $x^2 + y^2 = r^2$ as diameter is

A. $x^2 + y^2 - r^2 - 2p(x\cos\alpha + y\sin\alpha - p) = 0$

B. $x^2 + y^2 - r^2 + 2p(x\cos\alpha - p) = 0$

C. $x^2 + y^2 - r^2 - p(x\cos\alpha + y\sin\alpha - p) = 0$

D. $x^2 + y^2 - r^2 + 2p(x\cos\alpha + y\sin\alpha + p) = 0$

Answer: A

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40. The equation of the circle described on the common chord of the circles $x^2 + y^2 + 2x = 0, x^2 + y^2 + 2y = 0$ as diameter is

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

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

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

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

Answer: C

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41. If the circle $x^2 + y^2 + 2x + 3y + 1 = 0$ cuts another circle $x^2 + y^2 + 4x + 3y + 2 = 0$ in A and B , then the equation of the circle with AB as a diameter is

A. $2x^2 + 2y^2 + 2x + 6y + 1 = 0$

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

C. $x^2 + y^2 + x + 6y + 1 = 0$

D. $2x^2 + 2y^2 + x + 3y + 1 = 0$

Answer: A

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42. The equation of the circle which passes through the origin has its centre on the line x+y=4 and cuts orthogonally the circle $x^2 + y^2 - 4x + 2y + 4 = 0$

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

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

C. $x^2 + y^2 - 6x - 2y = 0$

D. $x^2 + y^2 + 4x - 12y = 0$

Answer: A

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43. The circles having radii 1, 2, 3 touch cach other externally then the radius of the circle which cuts three circles orthogonally is

A. 1

B. 4

C. 6

D. 2

Answer: A

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44. A circle passes through the points (3,4) and cuts the circle $x^2 + y^2 = a^2$ orthogonally, the locus of its centre is a straight line . If the distance of this straight line from the origin is 25 , then $a^2 =$

A. 250

B. 225

C. 100

D. 25

Answer: B

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45. The locus of the centre of the circle, which cuts the circle $x^2 + y^2 - 20x + 4 = 0$ orthogonally and touchs the line x = 2 , is

A. $x^2 = 16y$

B. $y^2 = 4x$

C. $y^2 = 16x$

D. $x^2 = 4y$

Answer: C

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Practice Exercise

1. If radii are 2, $\sqrt{2}$ and distance between centres is $\sqrt{2}$ then the angle between the circles is

A. $\frac{\pi}{6}$

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

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

D. $\frac{3\pi}{4}$

Answer: D

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2. If the angle between the circle $x^2 + y^2 - 2x - 4y + c = 0$ and $x^2 + y^2 - 4x - 2y + 4 = 0$ is 60°, then C is equal to

A. $\frac{3 \pm \sqrt{5}}{2}$

B. $\frac{6 \pm \sqrt{5}}{2}$

C. $\frac{9 \pm \sqrt{5}}{2}$

D. $\frac{7 \pm \sqrt{5}}{2}$

Answer: D

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3. The angle between the circles $x^2 + y^2 + 4x + 8y + 18 = 0$ and $x^2 + y^2 + 2x + 6y + 8 = 0$ is

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

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

C. $\frac{\pi}{6}$

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

Answer: B

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4. If the circles of same radii and with centres (1, 3), (9, 11) cut orthogonally then radius is

A. 2

B. 4

C. 8

D. 16

Answer: C

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5. The circles $x^2 + y^2 - 6x - 8y + 12 = 0, x^2 + y^2 - 4x + 6y + k = 0$, cut orthogonally then k=

A. -12

B. -24

C. 12

D. 24

Answer: B

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6. The circle with centre (1, 2) cuts the circle $x^2 + y^2 + 14x - 16y + 77 = 0$ orthogonally then its radius is

A. 4

B. 8

C. 3

D. 2

Answer: B

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7. If the angle between two equal circles with centres (3, 10) (-5, 4) is 120° then the radius of the circles is

A. 10

B. 5

C. 2

D. 1

Answer: A

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8. If a circle through the point (2, 3) cuts $x^2 + y^2 = 8$ orthogonally then the locus of its centre is

A. 4x+6y-21=0

B. x+y-7=0

C. x-y=5

D. x+y=9

Answer: A

View Text Solution

9. The circle through origin and cutting $x^2 + y^2 - 3x - 18 = 0$ and $x^2 + y^2 - 4y - 20 = 0$ orthogonally is

A. $x^2 + y^2 - 4x - 6y = 0$

B. $x^2 + y^2 + 12x + 10y = 0$

C. $x^2 + y^2 - 6x - 5y = 0$

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

Answer: B

View Text Solution

10. The equation of the circle passing through (-1, -1) and cutting the circles $x^2 + y^2 - 4x + 2y - 10 = 0$ and $x^2 + y^2 - 2x - 4y - 24 = 0$ orthogonally is

A. $x^2 + y^2 + 4x + 6y + 8 = 0$

B. $x^2 + y^2 - 4x - 3y - 7 = 0$

C. $x^2 + y^2 - 6x - 18y - 20 = 0$

D. $x^2 + y^2 - 2x - 2y + 7 = 0$

Answer: A

View Text Solution

11. The circle passing through the points (2, 3), (0, 0) and intersecting $x^2 + y^2 + 3x + 5y - 9 = 0$ orthogonally is

A. $x^2 + y^2 - 3x - 11y = 0$

B. $x^2 + y^2 + 11x - 3y = 0$

C. $x^2 + y^2 + 3x + 11y = 0$

D. $x^2 + y^2 - 11x + 3y = 0$

Answer: D

View Text Solution

12. The point (3, 1) is a point on a circle C with centre (2, 3) and C is orthogonal to $x^2 + y^2 = 8$. The conjugate point of (3,1) w.r.t $x^2 + y^2 = 8$ which lies on C is

A. (5,1)

B. (5,4)

C. (1,5)

D. (0,2)

Answer: C

View Text Solution

13. The locus of the centre of the circle cutting the circles $x^2 + y^2 - 2x - 6y + 1 = 0, x^2 + y^2 - 4x - 10y + 5 = 0$ orthogonally is

A. x+2y-2=0

B. x+y=0

C. x-y=0

D. x+y+1=0

Answer: A

View Text Solution

14. Common chord of the circles $x^2 + y^2 - 4x - 6y + 9 = 0, x^2 + y^2 - 6x - 4y + 4 = 0$ is

A. 2x-2y+5=0

B. 2x+2y-5=0

C. x+y=0

D. x+y-2=0

Answer: A

View Text Solution

15. The common tangent at the point of contact of the two circles $x^2+y^2-4x-4y=0, x^2+y^2+2x+2y=0$ is

A. x+y=0

B. x-y=0

C. 2x-3y=0

D. x-2y=0

Answer: A

View Text Solution

16. For the circles $3x^2+3y^2+x+2y-1=0, 2x^2+2y^2+2x-y-1=0$ radical axis is

A. 4x-7y=1

B. 3x+y-2=0

C. x-3y=0

D. 4x-7y=5

Answer: A

View Text Solution

17. The distance of the point (1, 2) from the common chord of the circles $x^2 + y^2 - 2x + 3y - 5 = 0$ and $x^2 + y^2 + 10x + 8y = 1$ is

A. 4

B. 3

C. 2

D. 1

Answer: C

View Text Solution

18. The intercept made by the radical axis of the circles $x^2 + y^2 + 6x - 16 = 0$ and $x^2 + y^2 - 2x - 6y - 6 = 0$ on x-axis is

A. $\frac{3}{4}$

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

C. $\frac{1}{4}$

D. `7

Answer: B

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19. The centre of the cirlces cutting three circles $x^2 + y^2 - 2x - 4y + 4 = 0, x^2 + y^2 - 4x - 6y + 4 = 0, x^2 + y^2 - 4x - 8$ orthogonally is

A. (0,0)

B. (1,2)

C. (2,3)

D. (-1,-2)

Answer: A

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20. B and C are two points on the circle $x^2 + y^2 = a^2$ point A (b,c) lies on that circle such that AB = AC = d, then the equation of the line $\leftrightarrow (BC)$ is

A. $bx + ay = a^2 - d^2$

B. $bx + ay = d^2 - a^2$

C. $2(bx + cy) = 2a^2 - d^2$

D. $2(bx + ay) = 2a^2 - d^2$

Answer: C

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21. If C_1 (1, 3) and C_2(4, 3)are the centres of two circles whose radical axis is y-axis. If the radius of the 1st circle is $2\sqrt{2}$ units, then the radius of the second circle is

A. $\sqrt{23}$

B. 3

C. 4

D. $2\sqrt{2}$

Answer: A

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22. The radical centre of the circles $x^2 + y^2 = 9, x^2 + y^2 - 2x - 2y - 5 = 0, x^2 + y^2 + 4x + 6y - 19 = 0$ is

A. (0,0)

B. (1,1)

C. (2,2)

D. (3,3)

Answer: B

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23. The equation of the circle which cuts orthogonally the three circles, $x^2 + y^2 + 2x + 17y + 4 = 0, x^2 + y^2 + 7x + 6y + 11 = 0, x^2 + y^2 - x +$ is

A. $x^2 + y^2 - 6x - 4y - 44 = 0$

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

C. $x^2 + y^2 - 14x - 5y - 34 = 0$

D. $x^2 + y^2 - 5x - 14y - 34 = 0$

Answer: A

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24. The equation of the circle which cuts orthogonally the three circles $x^2 + y^2 + 4x + 2y + 1 = 0, 2x^2 + 2y^2 + 8x + 6y - 3 = 0, x^2 + y^2 + 6x -$ is

A. $x^2 + y^2 - 6x - 4y - 44 = 0$

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

C. $x^2 + y^2 - 14x - 5y - 34 = 0$

D. $x^2 + y^2 - 5x - 14y - 34 = 0$

Answer: C

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25. If A(2, -1), B(3, 1), C(1, -2) then the radical centre of the circles with AB, BC, CA as diameters is

A. (1,-2)

B. (2,1)

C. (11,-7)

D. (4,7)

Answer: C

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26. The length of the common chord of the two circles of radii 10, 24 whose centres are 26 units apart is

A. $\frac{10}{13}$ units

B. 240

C. $\frac{240}{13}$ units

D. $\frac{120}{13}$ units

Answer: C

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27. The radical axis of two circles S=0, S'=0 does not exist if

A. the centres of the circles are inverse points of S = 0

B. the centres of the circles are conjugate points w.r.t. S = 0

C. the centres of the circles are same

D. the centres are on X-axis.

Answer: C

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28. If S = 0, S' =0 are two touching circles then angle between their radical axis and the common tangent at the at their points of contanct is

A. 30°

B. 60°

C. 0°

D. 90°

Answer: C

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29. If S = 0, S' =0 are touching circles, then the angle between the line of centres and radical axis of S = 0, S' =0 is

A. 90°

B. 30°

C. 0°

D. 60°

Answer: A

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30. The angle between two circle inersecting at two distinct points is 90° then

A. tangent at their points of intersection are parallel.

B. normal at the point of intersection of one circle is any tangent to the other circle.

C. tangent at the point of intersection of one circle make 90° with X-axis.

D. normal at the point of intersection of one circle is parallel to Y-axis

Answer: B

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31. Let S = 0, S' = 0 be two circle intersecting at two distinct points and L_1 be their common chord, L_2 is the line joing their centres and L_3 is the radical axis. Then

A. L_1 is not perpendicular to L_2

B. L_1, L_2 are perpendicular

C. L_1 is parallel to L_2

D. $L_1 \wedge L_3$

Answer: B

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32. The length of the common chord of the circles $(x-6)^2+(y-4)^2=4, (x-4)^2+(y-6)^2=4$ is

A. $\sqrt{2}$

B. $7\sqrt{2}$

C. $\sqrt{7}$

D. $2\sqrt{7}$

Answer: D

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33. Assertion (A): The locus of the centres of the circle through the points of intersection of the circles $x^2 + y^2 - 2x + y = 0, x^2 + y^2 = 1$ is 2x-y+1=0

Reason (R) : The locus of the centres of the circles through the intersection of the two circles is its radical axis.

A. Assertion is true, Reason is false

B. Assertion is false , Reason is true

C. Assertion is true , Reason is true , Reason $\Rightarrow$ Assertion

D. Assertion is false , Reason is false

Answer: D

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34. Assertion (A): If the circle $x^2 + y^2 + 6x - 2y + k = 0$ bisects the circumference of the circle $x^2 + y^2 - 2x - 6y - 15 = 0$, then k is -35.

Reason (R) : If a circle bisects the circum ference of another circle, then common chord passes through the centre of the second circle.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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35. The length of the common chord of the circles $x^2 + y^2 + ax + by + c = 0$ and $x^2 + y^2 + bx + ay + c = 0$ is

A. $\sqrt{\frac{(a+b)^2 - 8c}{2}}$

B. $\sqrt{\frac{(a-b)^2 - 8c}{2}}$

C. $\sqrt{\frac{(a-b)^2 + 8c}{2}}$

D. $\sqrt{\frac{(a+b)^2 + 8c}{2}}$

Answer: A

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36. Observe the following statements:

statement I: The radical centre of

$S \equiv x^2 + y^2 - 1 = 0$

$S' \equiv x^2 + y^2 + 6x - 2y - 1 = 0$

$S'' \equiv x^2 + y^2 - 12x + 4y - 1 = 0$ does not exist.

statement II : The radical centre of three circles whose centers are collinear does not exist because radical axes of each pair of circles are parallel.

A. I is true, II is true, But II is not the correct explaination for I

B. I and II are true. II is correct explanation of I

C. I is true, II is false

D. I is false, II is true

Answer: B

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Exercise 2 1

1. Find the acute angle or angle or intersection of the following circles.

a. $x^2 + y^2 - 12x - 6y + 41 = 0, x^2 + y^2 + 4x + 6y - 59 = 0$

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2. Find the acute angle or angle or intersection of the following circles.

$x^2 + y^2 + 4x - 14y + 28 = 0, x^2 + y^2 + 4x - 5 = 0$

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3. Show that the angle between the circles

$x^2 + y^2 = a^2, x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$

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4. Show that the circles given by the following equations intersect each other orthogonally .

$x^2 + y^2 + 2my - g = 0$

$x^2 + y^2 - 2lx + g = 0$

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5. Show that the circles given by the following equation intersect each other orthogonally.

$x^2 + y^2 - 2x - 2y - 7 = 0,$

$3x^2 + 3y^2 - 8x + 29y = 0.$

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6. Show that the circles given by the following equations intersect each other orthogonally .

$x^2 + y^2 + 4x - 2y - 11 = 0$

$x^2 + y^2 - 4x - 8y + 11 = 0$

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7. Show that the circles given by the following equation intersect each other orthogonally.

$x^2 + y^2 - 2x + 4y + 4 = 0,$

$x^2 + y^2 + 3x + 4y + 1 = 0.$

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8. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 + 2by - k = 0$

$x^2 + y^2 + 2ax + 8 = 0$

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9. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 - 6x - 8y + 12 = 0, x^2 + y^2 - 8x + 6y + k = 0$

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10. Find k if the following pairs of circles are orthogonal

$x^2 + y^2 - 16y + k - 0, x^2 + y^2 + 4x + 8 = 0$

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11. Find the equation of the circle which passes through the origin and intersects each of the following circles orthogonally.

$x^2 + y^2 - 4x + 6y + 10, x^2 + y^2 + 12y + 6 = 0$

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12. Find the equation of the circle which passes through the origin and intersects the circles below, orthogonally.

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

$x^2 + y^2 - 8y + 12 = 0.$

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13. Find the equation of the circle which passes through (1,1) and cuts orthogonally each of the circles $x^2 + y^2 - 8x - 2y + 16 = 0$ and $x^2 + y^2 - 4x - 4y - 1 = 0$

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14. Find the equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having the centre at (2,3)

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15. Find the equation of the circle which passes through the points (2,0) (0,2) and orthogonal to the circle $2x^2 + 2y^2 + 5x - 6y + 4 = 0$.

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16. Find the equation of circle which intersect the circle $x^2 + y^2 - 6x + 4y - 3 = 0$ orthogonally and passes through the point (3,0) and touches Y-axis.

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17. Find the equation of the circle which cuts the circles $x^2 + y^2 - 4x - 6y + 11 = 0$ and $x^2 + y^2 - 10x - 4y + 21 = 0$ orthogonally and has the diameter along the line 2x+3y=7.

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18. Find the equation of the circle passing through the origin, having its centre on the line x+y=4 and intersecting the circle $x^2 + y^2 - 4x + 2y + 4 = 0$ orthogonally.

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19. The equation of the circle which cuts orthogonally the three circles $x^2 + y^2 + 4x + 2y + 1 = 0, 2x^2 + 2y^2 + 8x + 6y - 3 = 0, x^2 + y^2 + 6x -$ is

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20. Find the equation of the circle orthogonal to each of the circles

$x^2 + y^2 + 2x + 4y + 1 = 0, 2(x^2 - y^2) + 6x + 8y - 3 = 0, x^2 + y^2 - 2x$

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21. The equation of the circle passing through (1,2) and the points of intersection of the circles $x^2 + y^2 - 8x - 6y + 21 = 0$ and $x^2 + y^2 - 2x - 15 = 0$ is

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22. If the straight line 2x+3y=1 intersects the circle $x^2 + y^2 = 4$ at the points A and B then find the equation of the circle having AB as diameter.

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23. If x+y=3 is the equation of the chord AB of the circle $x^2 + y^2 - 2x + 4y - 8 = 0$, find the equation of the circle having as

diameter.

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Exercise 2 2

1. Find the equation of the radical axis of the following circles

$x^2 + y^2 - 3x - 4y + 5 = 0, 3\left(x^2 + y^2\right) - 7x + 8y - 11 = 0$

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2. Find the equation of the radical axis of the following circles.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$x^2 + y^2 + 4x + y = 0$

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3. Find the equation of the radical axis of the following circles

$x^2 + y^2 + 4x + 6y - 7 = 0, 4\left(x^2 + y^2\right) + 8x + 12y - 9 = 0$

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4. Find the equation of the radical axis of the following circles.

$x^2 + y^2 - 2x - 4y - 1 = 0$

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

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5. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 - 4x - 4y + 3 = 0$

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

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6. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 + 2x + 3y + 1 = 0$

$x^2 + y^2 + 4x + 3y + 2 = 0$

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7. Find the equation of common chord of the following pair of circlers

$(x - a)^2 + (y - b)^2 = c^2, (x - b)^2 + (y - a)^2 = c^2 (a \neq b)$

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8. Find the equation of the common tangent of the following circles at their point of contact

$x^2 + y^2 = 10x - 2y + 22 = 0, x^2 + y^2 + 2x = 8y + 8 = 0$

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9. Find the equation of the common tangent of the following circles at their point of contact.

$x^2 + y^2 - 8y - 4 = 0$

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

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10. Show that the circles $x^2 + y^2 - 8x - 2y + 8 = 0$ and $x^2 + y^2 - 2x + 6y + 6 = 0$ touch each other and find the point of contact.

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11. If the two circles $x^2 + y^2 + 2gz + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other then show that $f'g = fg'$

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12. Find the radical centre of the following circles

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

$x^2 + y^2 - 2x - 4y - 1 = 0$

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

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13. Find the equation of the circle which cuts the following circles orthogonally.

$x^2 + y^2 + 4x - 7 = 0, 2x^2 + 2y^2 + 3x + 5y - 9 = 0, x^2 + y^2 + y = 0$

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14. Show that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ is the diameter of the second circle and also find its length.

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15. Find the equation of the common chord of the following pair of circles

$x^2 + y^2 + 2x + 3y + 1 = 0$

$x^2 + y^2 + 4x + 3y + 2 = 0$

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16. Find the equation and length of the common chord of the following circles.

$x^2 + y^2 - 5x - 6y + 4 = 0,$

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

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17. Prove that the radical axis of the circles $x^2 + y^2 + 2gx + 2fy + c = 0$ and $x^2 + y^2 + 2g'x + 2f'y + c' = 0$ is the diameter of the later circle (or the former bisects the circumference of the later) if 2g'(g-g')+2f'(f-f')=c-c'

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18. Show that the circles $x^2 + y^2 + 2ax + c = 0$ and $x^2 + y^2 + 2by + c = 0$ touch each other if $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c}$

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19. Show that the circles $x^2 + y^2 - 2x = 0$ and $x^2 + y^2 + 6x - 6y + 2 = 0$ touch each other. Find the coordinates of the point of contact. Is the point of contact external of internal?

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20. Find the equation of the circle which cuts the following circles orthogonally.

$x^2 + y^2 + 4x - 7 = 0, 2x^2 + 2y^2 + 3x + 5y - 9 = 0, x^2 + y^2 + y = 0$

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21. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 2x + 4y + 1 = 0$

$2x^2 + 2y^2 + 6x + 8y - 3 = 0$

$x^2 + y^2 - 2x + 6y - 3 = 0$

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22. Find the equation of the circle which cuts each of the following circles orthogonally.

$x^2 + y^2 + 2x + 17y + 4 = 0$

$x^2 + y^2 + 7x + 6y + 11 = 0$

$x^2 + y^2 - x + 22y + 3 = 0$

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