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Class: 11
Subject: Math's
Topic: Circles
No. of Questions: 20

1. If one end of the diameter of a circle $x^2 + y^2 - 8x - 4y + c = 0$ is (− 3, 2), then the other end is

(A) (5, 3)
(B) (6, 2)
(C) (1, − 8)
(D) (11, 2)

Sol: D

The centre of the circle is (4, 2).
We can check from the given options to find out the two coordinates between which the centre lies.
And option 4 satisfies: (- 3 + 11/2, 2 + 2/2) = (4, 2) is the centre.

2. The number of tangents which can be drawn from the point (1, 2) to circle $x^2 + y^2 = 5$ is

(A) 1
(B) 2
(C) 3
(D) 0

Sol: A

To find out the number of tangents, we first need to find out the distance of the point from the circle.

Distance of point from centre = $\sqrt{5}$

Radius of the circle = $\sqrt{5}$
The point lies on the circle and we can draw only one tangent.

3. What is the radius of a circle inscribed in the triangle formed by lines x = 0, y = 0 and 4x + 3y − 24 = 0?

(A) 12
(B) 2
(C) $2\sqrt{2}$
(D) 6

Sol: B

We can see that the given equations form a right-angled triangle, with sides 6, 8, 10. Area of the triangle is Δ = 24 and s = 6 + 8 + 10 / 2 = 12
Hence, in-radius= Δ/s = 2

4. The equation of the chord of a circle $x^2 + y^2 - 4x = 0$ whose midpoint is (1, 0) is

(A) y = 2
(B) y = 1
(C) x = 2
(D) x = 1

Sol: D

Centre of the circle is: (2, 0)
Line passing through the centre and the midpoint of the chord is (radius): y = 0
We know, radius is always perpendicular to the chord, and only option 4 satisfies both the conditions of perpendicularity and midpoint (1, 0) lies on it.

5. The equation of circle whose radius is 5 and which is touching the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ at the point (5, 5) is

(A) $x^2 + y^2 + 18x + 16y + 120 = 0$
(B) $x^2 + y^2 - 18x - 16y + 120 = 0$
(C) $x^2 + y^2 - 18x + 16y + 120 = 0$
(D) $x^2 + y^2 + 18x - 16y + 120 = 0$

Sol: B

We can see that the given options are of radius 5 and touching the circle. We are to find the circle which touches at (5, 5) which is satisfied only by option 2.
Alternative solution:
All the circles are touching and having radius 5, but the center of the circle which is touching

the given circle at (5, 5) will obviously lie in the first quadrant.

6. The length of tangent from (5, 1) to circle $x^2 + y^2 + 6x - 4y - 3 = 0$ is

(A) 81
(B) 29
(C) 7
(D) 21

Sol: C

7. The equation of diameter of circle $x^2 + y^2 = 2ay$; that is perpendicular to straight line $x + 2y = 4$ is

(A) $2x - y + a = 0$
(B) $x + 2y - a = 0$
(C) $2x - 2y + a = 0$
(D) none of these

Sol: A

8. If the sum of the distances of a point from two perpendicular lines in a plane is 1, then its locus is

(A) a square
(B) a circle
(C) a straight line
(D) two intersecting lines

Sol: A

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9. If y = 2 x is a chord of the circle $x^2 + y^2 - 10x = 0$, find the equation of the circle with this chord as a diameter

Sol:

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

Putting $y = 2x$ in $x^2 + y^2 - 10x = 0$ we get

$5x^2 - 10x = 0 \Leftrightarrow 5x(x-2) = 0 \Leftrightarrow x = 0$ or $x = 2$

Now, $x = 0 \Rightarrow y = 0$ & $x = 2 \Rightarrow y = 4$

$\therefore$ the points of intersection of the given chord & the given circle are

$A(0,0)$ & $B(2,4)$

$\therefore$ the required equation of the circle with AB as diameter is

$(x-0)(x-2)+(y-0)(y-4)=0$

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

10. Find the equation of a circle, the end points of one of whose diameters are A (-3, 2) & B (5, 3).

Sol

Let the equation be $(x-x_1)(x-x_2)+(y-y_1)(y-y_2)=0$

Hence $x_1 = -3, y_1 = 2$ & $x_2 = 5, y_2 = -3$

So $(x+3)(x-5)+(y-2)(y+3)=0$

$x^2 - 2x - 15 + y^2 + y - 6 = 0$

$x^2 + y^2 - 2x + y - 21 = 0$

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11. The equation $x^2 + y^2 - 12x + 8y - 72 = 0$ represent a circle find its centre (A) (-6,-4) (B) (6, - 4) (C) (6, 4) (D) (-6, 4)

Sol: (6,-4)

12. Find the equation of a circle, the end points of one of whose diameters are $A\ (2, -3)\ \&\ B\ (-3,5)$.

Sol:

Let the end points of one of whose diameters are $(x_1, y_1)\ \&\ (x_2, y_2)$ is given by

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$$

Hence $x_1 = 2,\ y_1 = -3\ \ \&\ \ x_2 = -3,\ y_2 = 5$

$\therefore$ The required equation of the circle is

$$(x-2)(x+3) + (y+3)(y-5) = 0$$

$$\Rightarrow x^2 + y^2 + x - 2y - 21 = 0$$

13. Find the equation of a circle with centre (b, a) & touching $x -$ axis?

(A) $x^2 + y^2 - 2bx + 2ay + b^2 = 0$
(B) $x^2 + y^2 + 2bx - 2ay + b^2 = 0$

(C) $x^2 + y^2 - 2bx - 2ay + b^2 = 0$

(D) None of these

Sol: (C)

$$x^2 + y^2 - 2bx - 2ay + b^2 = 0$$

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14. Show that the equation $6x^2 + 6y^2 + 24x - 36y - 18 = 0$ represents a circle. Also find its centre & radius.

Sol:

$$6x^2 + 6y^2 + 24x - 36y + 18 = 0$$

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

Where, $2g = 4, 2f = -6 \,\&\, C = 3$

$\therefore g = 2, f = -3 \,\&\, C = 3$

Hence, centre of circle $= (-g, -f) = (-2, 3)$

&

Radius of circle $= \sqrt{4+9+9} = \sqrt{20}$

$= 2\sqrt{5}$ units

15. Find the equation of a circle with centre (P,Q) & touching the y axis

(A) $x^2 + y^2 + 2QY + Q^2 = 0$

(B) $x^2 + y^2 - 2\,px + 2Qy\;\; Q^2 = 0$

(C) $x^2 + y^2 - 2\,px + 2Qy + Q^2 = 0$

(D) None of these

Sol: (C)

$$x^2 + y^2 - 2px + 2Qy + Q^2 = 0$$

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16. Show that the equation $x^2 + y^2 - 6x + 4y - 36 = 0$ represent a circle, also find its centre & radius?

Sol:

This is of the form $x^2 + y^2 + 2gx + 2Fy + c = 0,$

where $2g = -6, 2f = 4 \;\&\; c = -36$

$\therefore q = -3, f = 2 \;\&\; c = -36$

So, centre of the circle $= (-g, -f) = (3, -2)$

&

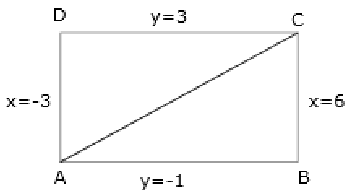
Radius of the circle $= \sqrt{q^2 + f^2 - c} = \sqrt{9 + 4 + 36}$

$= 7$ units

17. Find the equation of a circle drawn on the diagonal of the rectangle as its diameter, whose sides are $x = -3,\ x = 6,\ y = 3 \;\&\; y = -1$

Sol:

Let ABCD be the given rectangle &
$AD = x = -3,\ BC = x = 6,\ \ AB = y = -1 \;\&\; CD = y = -3$



Then $A(-3, -1)$ & $c(6, 3)$

So the equation of the circle with AC as diameter is given as

$(x+3)(x-6) + (y+1)(y-3) = 0$

$\Rightarrow x^2 + y^2 - 3x - 2y - 21 = 0$

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18. The equation of the circle having centre (1, - 2) and passing through the point of intersection of the lines $3x + y - 14$ and $2x + 5y = 18$ is

(A) $x^2 + y^2 - 2x + 4y - 20 = 0$

(B) $x^2 + y^2 - 2x - 4y - 20 = 0$

(C) $x^2 + y^2 + 2x - 4y - 20 = 0$

(D) $x^2 + y^2 + 2x + 4y - 20 = 0$

Sol: (A)

The point of intersection of $3x + y - 14 = 0$ and $2x + 5y - 18 = 0$ are $x = 4, y = 2, i.e.,$ the point (4, 2)

Therefore, the radius is = $\sqrt{9 + 16}$ = 5 and hence the equation of the circle is given by

$(x - 1)^2 + (y + 2)^2 = 25$

Or $x^2 + y^2 - 2x + 4y - 20 = 0$.

19. A circle has radius 3 units and its centre lies on the line y = $x - 1$. If it passes through the point (7, 3), its equation is ____________________.

Sol: Let (h.k) be the centre of the circle. Then k = h – 1. Therefore, the equation of the circle is given by $(x - h)^2 + [y - (h - 1)]^2 = 9$ $\dots\dots..(1)$

Given that the circle passes through the point (7, 3) and hence we get

$(7 - h)^2 + \left(3 - (h - 1)\right)^2 = 9$

Or $(7 - h)^2 + (4 - h)^2 = 9$

Or $h^2 - 11h + 28 = 0$

Which gives $(h - 7)(h - 4) = 0 \Rightarrow$ h = 4 or h = 7

Therefore, the required equations of the circles are $x^2 + y^2 - 8x - 6y + 16 = 0$

Or $x^2 + y^2 - 14x - 12y + 76 = 0$

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20. Circle on which the coordinates of any point are (2 + 4 cosθ, -1 + 4 sinθ) where θ is parameter is given by $(x-2)^2+(y+1)^2=16$.

Sol: True. From given conditions, we have

$$x = 2 + 4\,cos\theta \;\Rightarrow (x-2) = 4\,cos\theta$$

And $y = -1 + 4\,sin\theta \;\Rightarrow y + 1 = 4\,sin\theta$

Squaring

And adding we got $(x-2)^2+(y+1\,)^2=16$