Practice Questions

Q1. Find the equation of the circle which passes through the points (20, 3), (19, 8) and (2, -9). Find its centre and radius.

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S1. This is a simple application of class notes formulas. If one remebers the formulas using some trick, then it can be done easily just by putting values in formulas. We can solve 3 equations to get 3 unknowns of general form. By substitution of coordinates in the general equation of the circle given by

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

, we have

$$\begin{aligned} 40g + 6f + c &= -409 \\ 38g + 16f + c &= -425 \\ 4g - 18f + c &= -85 \end{aligned}$$

From these three equations, we get g = - 7, f = - 3 and c = -111 Hence, the equation of the circle is

$$\begin{aligned} & x^2 + y^2 - 14x - 6y - 111 = 0 \\ \implies & (x-7)^2 + (y-3)^2 = 132 \end{aligned}$$

Therefore, the centre of the circle is (7, 3) and radius is 13.

Practice Questions

Q2. 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

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

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S2. Note that to get intersection point of two lines we just need to solve two linear equation problem.

$$\begin{aligned} 3x + y - 14 &= 0 \\ 2x + 5y - 18 &= 0 \end{aligned}$$

This gives us intersection point: $x = 4, y = 2$. Now radius of circle is:

$$\begin{aligned} r^2 &= (4-1)^2 + (2+2)^2 \\ &= 9 + 16 = 25 \end{aligned}$$

We have radius = 5. Then c in general form is,

$$\begin{aligned} c &= g^2 + f^2 - r^2 \\ &= (-1)^2 + (2)^2 - 25 = -20 \end{aligned}$$

So general form is,

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

Hence option (1) is right.

Practice Questions

Q3. Find the equation of the circle which touches the both axes in first quadrant and whose radius is a.

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S3. It can be done just by looking at the below picture,

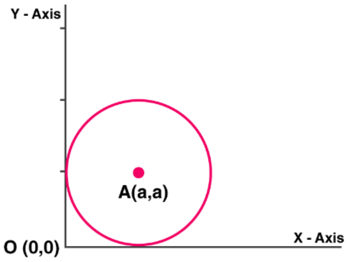

Figure 1: Circle with radius a

Now we can write equation of the center,

$$(x - a)^2 + (y - a)^2 = a^2$$

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Practice Questions

Q4. If a circle passes through the point (0, 0) (a, 0), (0, b) then find the coordinates of its centre.

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S4. This is also a simple application of class notes formulas, like que-1. By substitution of coordinates in the general equation of the circle given by

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

, we have

$$c = 0$$
$$a^2 + 2ga + c = 0$$
$$b^2 + 2fb + c = 0$$

From these three equations, we get center as

$$-g = \frac{a}{2}$$
$$-f = \frac{b}{2}$$

And radius to be,

$$r^2 = g^2 + f^2 - c = \frac{a^2 + b^2}{4}$$

Hence, the equation of the circle is

$$\left(x - \frac{a}{2}\right)^2 + \left(y - \frac{b}{2}\right)^2 = \frac{a^2 + b^2}{4}$$