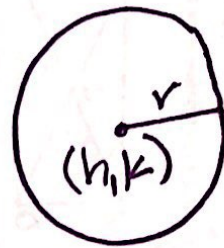


## 7.1: Equations of a circle

$$(x-h)^2 + (y-k)^2 = r^2$$

center:  $(h, k)$

radius:  $r$



Ex 1) Determine the center & radius of  
 $(x-4)^2 + (y+2)^2 = 20$

$$\boxed{\text{center: } (4, -2)}$$

$$\sqrt{r^2} = \sqrt{20}$$

$$\begin{array}{r} 20 \\ \sqrt{\phantom{00}} \\ 10 \phantom{0} \\ \hline 5 \phantom{0} \end{array}$$

$$\boxed{\text{radius} = \sqrt{20} = 2\sqrt{5}}$$

Ex 2) Write the equation of the circle with center  $(-3, -7)$  and radius of 4.

$$\boxed{(x+3)^2 + (y+7)^2 = 16}$$

$$\begin{aligned} r &= 4 \\ r^2 &= 4^2 \\ r^2 &= 16 \end{aligned}$$

Ex 3) Find the center & radius of

$$x^2 + y^2 + 4x - 12y + 36 = 0$$

$$(x^2 + 4x) + (y^2 - 12y) = -36$$

$$(x^2 + 4x + \boxed{4}) + (y^2 - 12y + \boxed{36}) = -36 + \boxed{4} + \boxed{36}$$

$$\frac{4}{2} = (2)^2 = 4$$

$$\frac{-12}{2} = (-6)^2 = 36$$

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

center: (-2, 6)  
radius: 2

$$\sqrt{r^2} = \sqrt{4}$$

Ex 4) Find the center & radius of

$$x^2 + y^2 + 6x = 43$$

$$(x^2 + 6x) + (y^2) = 43$$

$$(x^2 + 6x + \boxed{9}) + y^2 = 43 + \boxed{9}$$

$$\frac{6}{2} = (3)^2 = 9$$

$$(x+3)^2 + y^2 = 52$$

center: (-3, 0)  
radius:  $2\sqrt{13}$

$$\sqrt{r^2} = \sqrt{52}$$

$$\begin{array}{c} 52 \\ \swarrow \quad \searrow \\ \textcircled{13} \quad 4 \\ \swarrow \quad \searrow \\ \textcircled{2} \quad \textcircled{2} \\ 2\sqrt{13} \end{array}$$

you try:  $x^2 + y^2 + 8x - 2y + 5 = 0$

$$(x^2 + 8x + \boxed{16}) + (y^2 - 2y + \boxed{1}) = -5 + \boxed{16} + \boxed{1}$$

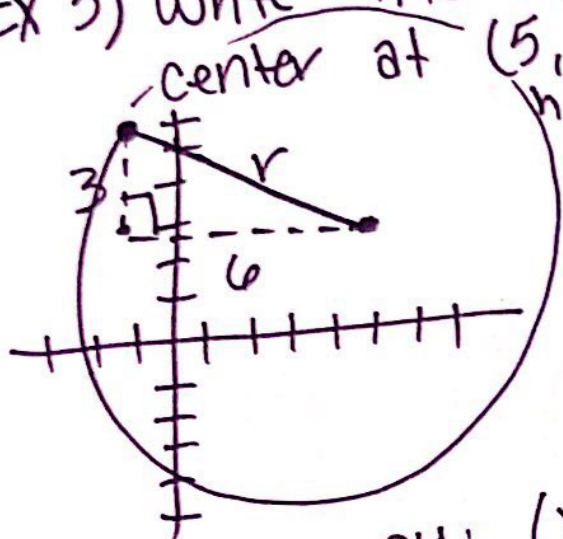
$$\frac{8}{2} = (4)^2 = 16$$

$$\frac{-2}{2} = (-1)^2 = 1$$

$$(x + 4)^2 + (y - 1)^2 = 12$$

center:  $(-4, 1)$   
radius:  $2\sqrt{3}$

Ex 5) Write the equation of the circle with center at  $(5, 3)$  that passes through  $(-1, 6)$



$$3^2 + 6^2 = r^2$$

$$45 = r^2$$

$(x - 5)^2 + (y - 3)^2 = 45$

another way:

$$(x - h)^2 + (y - k)^2 = r^2$$

$$(-1 - 5)^2 + (6 - 3)^2 = r^2$$

$$45 = r^2$$

$(x - 5)^2 + (y - 3)^2 = 45$