

10.7 Equation of a Circle SCRIPT

OBJECTIVE 1: Circle Equation Formula

For the equation of a circle with center at (h, k) and a radius of r units is:

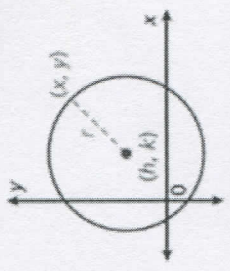
$$r^2 = (x - h)^2 + (y - k)^2$$

TASK 1: Write the equation for the circle with center $C(-3, 6)$ and a diameter of 6 units.

$$3^2 = (x - (-3))^2 + (y - 6)^2$$

$$9 = (x + 3)^2 + (y - 6)^2$$

$$\begin{aligned} d &= 2r \\ 6 &= 2r \\ 3 &= r \end{aligned}$$



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$r = \sqrt{(x - h)^2 + (y - k)^2}$$

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

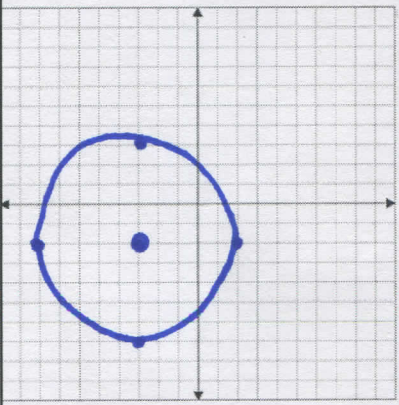
OBJECTIVE 2: Graphing Equations of Circles * given diameter endpoints: use midpoint to find the center: $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$
 * given coordinates to find radius length use distance formula:
 $d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}$

STEPS:

1. Determine the center (h, k)
2. Determine the radius, r
3. Plot the center
4. Mark the radius in four spots from the center: up, down, left, & right
5. Connect the four plotted radius spots around the center

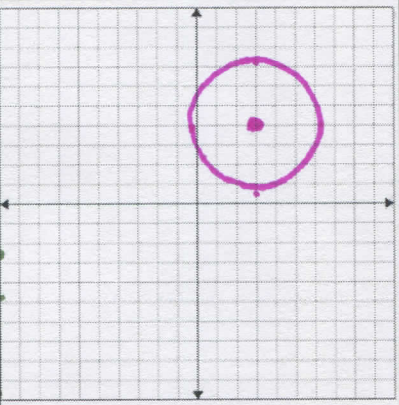
a) $(x + 2)^2 + (y - 3)^2 = 25$

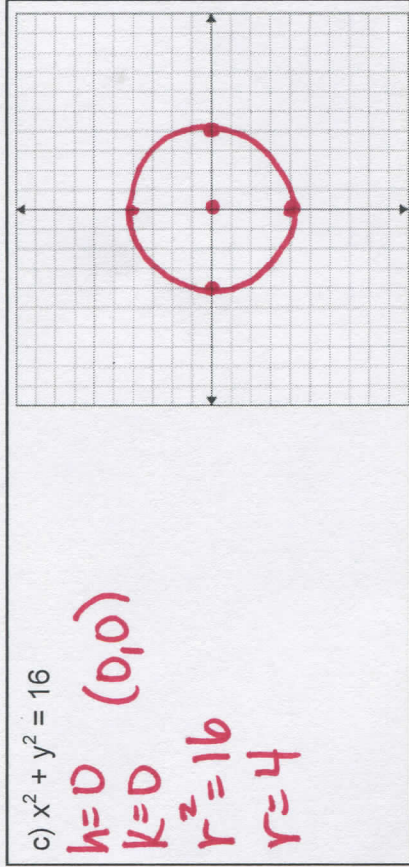
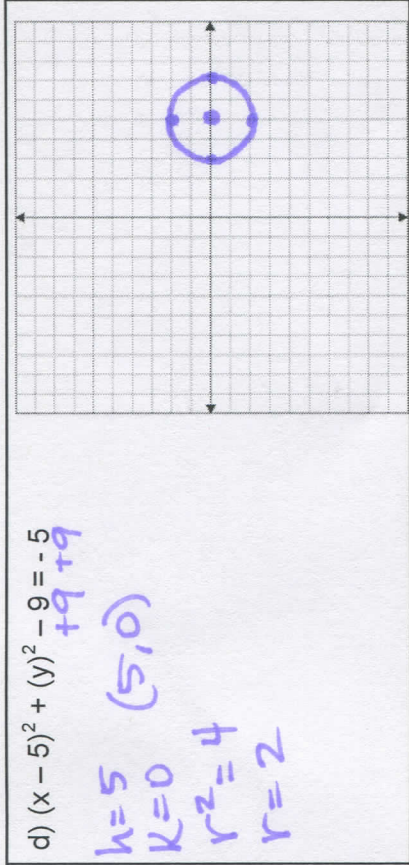
$$\begin{aligned} h &= -2 & (-2, 3) \\ k &= 3 \\ r^2 &= 25 \\ r &= 5 \end{aligned}$$



b) $(x - 4)^2 + (y + 3)^2 - 10 = 0$

$$\begin{aligned} (x-4)^2 + (y-(-3))^2 &= 10 \\ h &= 4 & (4, -3) \\ k &= -3 \\ r^2 &= 10 \\ r &= \sqrt{10} \approx 3.16 \dots \\ \sqrt{9} &= 3 \\ \sqrt{16} &= 4 \end{aligned}$$





c) $x^2 + y^2 = 16$
 $h=0$ $(0,0)$
 $k=0$
 $r^2=16$
 $r=4$

b) \bullet K that passes through J(6, 4) and has center K(1, -8)
 $KJ = \text{radius}$
 $KJ = \sqrt{(6-1)^2 + (4+8)^2}$
 $= \sqrt{5^2 + (12)^2} = \sqrt{25+144} = \sqrt{169} = 13$
 $(x-1)^2 + (y-(-8))^2 = 13^2$
 $(x-1)^2 + (y+8)^2 = 169$

a) \bullet P with center P(0, -3) and radius 8
 $(x-0)^2 + (y-(-3))^2 = 8^2$
 $x^2 + (y+3)^2 = 64$

c) Write the equation of the circle that has a diameter whose endpoints are (5, -7) & (-2, 4).
 x_1 y_1 x_2 y_2
 $\text{center: } \left(\frac{5-2}{2}, \frac{-7+4}{2} \right) = \left(\frac{3}{2}, -\frac{3}{2} \right)$
 $\text{diameter} = \text{radius} = \frac{\sqrt{(5-(-2))^2 + (-7-4)^2}}{2} = \frac{\sqrt{7^2 + (-11)^2}}{2} = \frac{\sqrt{49+121}}{2} = \frac{\sqrt{170}}{2}$
 $(x-\frac{3}{2})^2 + (y-\frac{-3}{2})^2 = (\frac{\sqrt{170}}{2})^2$
 $(x-\frac{3}{2})^2 + (y+\frac{3}{2})^2 = \frac{170}{4}$

Common Mistakes:

Still need help with: