Today, we are going to discuss:

<u>GPE.1</u> Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation

Up until now we have been learning about lines.
Match each blue with its corresponding orange.

1. y=mx + b :
2. parallel :
3. perpendicular :
4. distance :
5. section formula :

$\left(\dfrac{ax_2 + bx_1}{a+b}, \dfrac{ay_2 + by_1}{a+b} \right)$

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

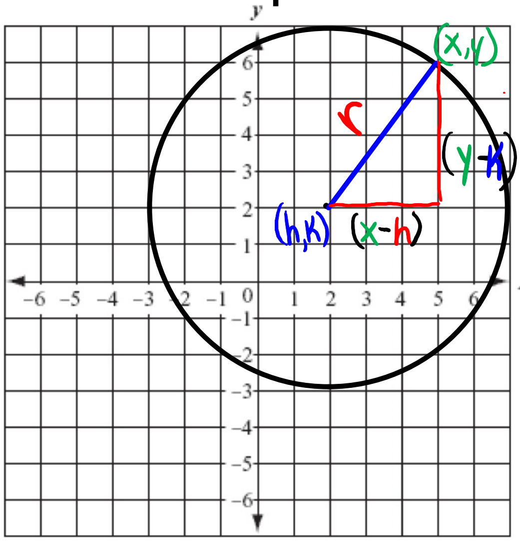
m = slope, b = y-intercept

same slope

opposite reciprocal slope

Now we are going to learn about circles.

Circles have their own equation. Lets see if we can come up with it.



Use the pythagorean theorem to find radius

$4^2+3^2=r^2$
$16+9=r^2$
$25=r^2$
$5=r$

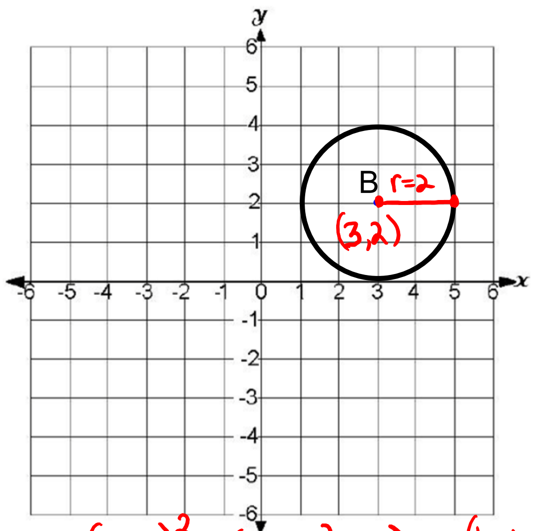
$$\boxed{(x-2)^2+(y-2)^2=25}$$

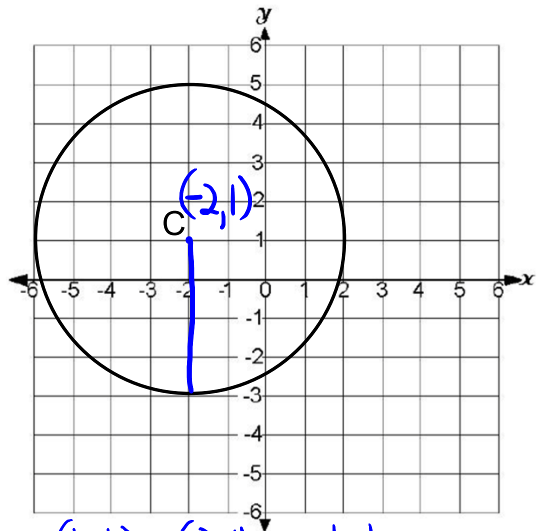
Equation for this circle

Standard Form Equation

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

Identify the center and radius, then write an equation for the circle.





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

$(h,k)=(3,2)=$ center

$r=2$

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

$\boxed{(x-3)^2+(y-2)^2=4}$

$(h,k)=(-2,1)=$ central

$r=4$

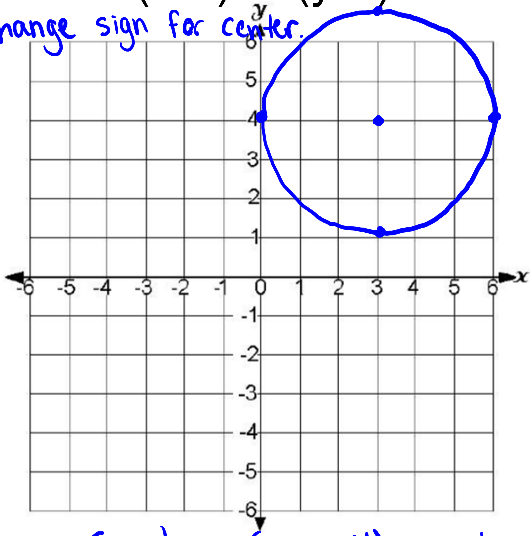
$\boxed{(x+2)^2+(y-1)^2=16}$

Geometry in Coordinate Plane

Identify the center and radius of a circle given its equation. Then graph it.

Ex. 3 $(x-3)^2 + (y-4)^2 = 3^2$

change sign for center.

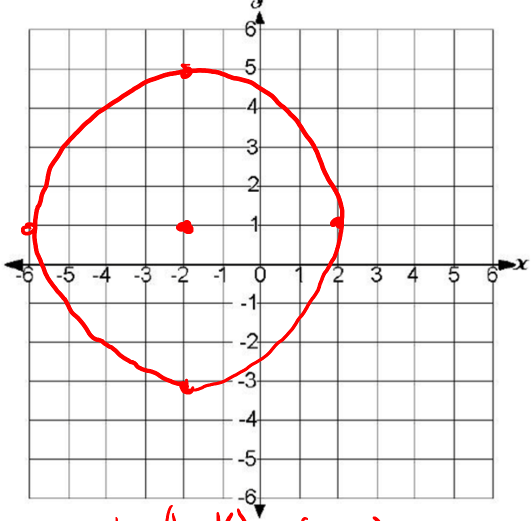


Center: (3, 4)

$r = 3$

plot Center then count Up, down, left, right the radius distance

Ex. 4 $(x+2)^2 + (y-1)^2 = 16$ r^2



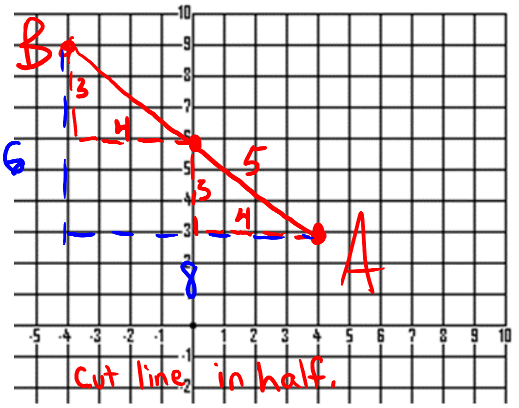
Center: (h, K) = (-2, 1)

$r = 4$

Another way to look at it.

Geometry in Coordinate Plane

Given that the diameter of a circle lies on points A(4,3) and B(-4,9); Identify the center and length of the radius. Then write the equation of the circle.



$r^2 = 3^2 + 4^2$

$r^2 = 9 + 16$

$r^2 = 25$

$\boxed{r = 5}$

Center: (0,6)

Equation: $(x-0)^2 + (y-6)^2 = 5^2$

$\boxed{x^2 + (y-6)^2 = 25}$

Another Example.

A circle has a center at (3,8) and a point on the circle is (-1,11). Write the equation of the circle.

h, k   x, y

Substitute in (h,k) and (x,y) to find the radius.

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

$(-1-3)^2 + (11-8)^2 = r^2$

$16 + 9 = r^2$

$25 = r^2$

$5 = r$

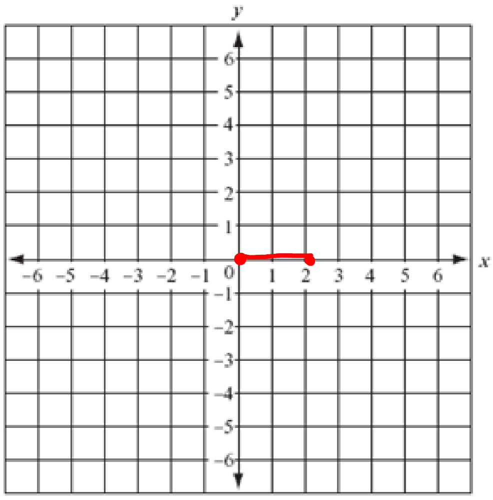
center (3,8) $r = 5$

Equation: $\boxed{(x-3)^2 + (y-8)^2 = 25}$

One more type of problem

Geometry in Coordinate Plane

Prove or disprove that the point (1, √3) lies on a circle centered at the origin and containing the point (0,2).



If the center is the origin and a point on the circle is (0,2) the radius is 2 and the equation is:

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

$$\boxed{x^2+y^2=4}$$

The point $(1,\sqrt{3})$ would have to lie on the circle if when substituted in, the equation holds true

$$1^2+(\sqrt{3})^2=4$$

$$1+3=4$$

$$4=4 \checkmark$$

$(1,\sqrt{3})$ lies on the circle.

Recap:

What is the standard form equation of a circle?

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

Given the two points that make a diameter of a circle, how would you find the coordinates for the center?

Midpoint of the line segment
a ratio of 1:1.