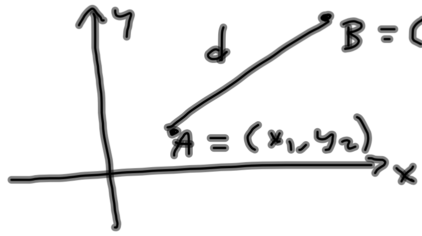
Last time, distance formula in §1.3

$A = (x_1, y_1)$, $B = (x_2, y_2)$ $\Longrightarrow$

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



New! A circle is the set of all points (x,y) that are the same distance r from a fixed point (the center) (h,k).

Let $A = (x,y)$ be a point on the circle of radius r centered at $B = (h,k) = (x_2, y_2)$
(x_1, y_1)

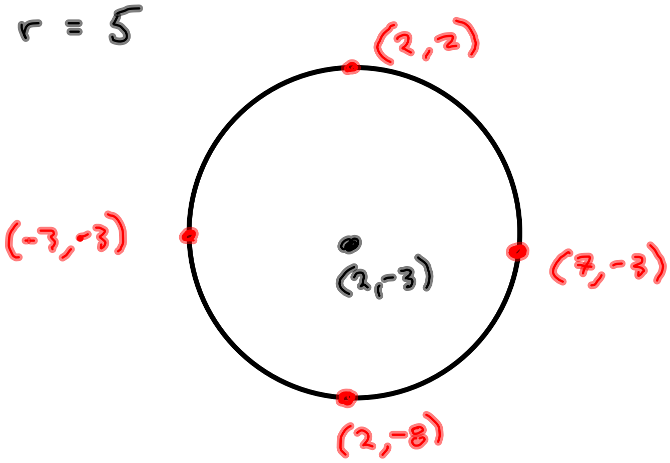
$d(A,B) = \sqrt{(x-h)^2 + (y-k)^2} = r$ so we have the <u>standard form of the equation</u> of a circle:

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

Find center, radius and give a quick sketch of

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

$(h,k) = (2,-3)$, $r = 5$



Complete the square:

x^2+6x

$\frac{6}{2}=3 \longrightarrow 3^2$

$= \underbrace{x^2+6x+3^2}-3^2$

$= (x+3)^2-9$ is a nice way to write it for graphing, as we'll see later.

But NOW, we use it to identify & graph circles

write $x^2+y^2-4x+6y=12$ in standard form & graph it!

$\boxed{x^2-4x+2^2}-4 \quad +y^2+6y+3^2-9 \quad =12$

$\frac{4}{2}=2 \rightarrow 2^2 \qquad \frac{6}{2}=3 \rightarrow 3^2$

$(x-2)^2-4 \quad +(y+3)^2-9 \quad =12$

$+4 \qquad +9 \qquad = +4+9$

$(x-2)^2+(y+3)^2=25$ See previous page.

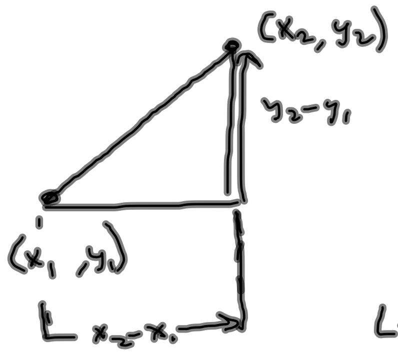
$$x^2+y^2-4x+6y=12$$

$$x^2-4x+2^2+y^2+6y+3^2=12+4+9$$

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

§1.4 LINES

$$\text{Slope} = \frac{\text{Difference in } y\text{'s}}{\text{Difference in } x\text{'s}} = \frac{\text{Rise}}{\text{Run}} = \frac{y_2-y_1}{x_2-x_1}$$



$$(x_1, y_1) = (3, 7)$$

$$(x_2, y_2) = (-3, 25)$$

$$\Longrightarrow m = \frac{25-7}{-3-3} = \frac{18}{-6} = -3$$

Let (x, y) be any point on this line. Then

$$m = \frac{y-y_1}{x-x_1}$$

$$m = \frac{y-y_1}{x-x_1}$$

$$\cancel{(x-x_1)}\frac{y-y_1}{\cancel{x-x_1}} = m(x-x_1)$$

$y-y_1 = m(x-x_1)$ is point-slope form of a line. It's great for building an equation when you know the slope & one point on the line.

$(x_1, y_1) = (-3, 25)$ &, $m = -3$ is given.

Build an equation for the line:

$y - 25 = -3(x+3)$ DONE.

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$y-25=-3(x+3)$ is plenty, unless you are asked for the slope-intercept form, specifically.

Slope-intercept form: $y = \underbrace{m}_{\text{Slope}}x+\underbrace{b}_{(0,b)\text{ is y-intercept.}}$

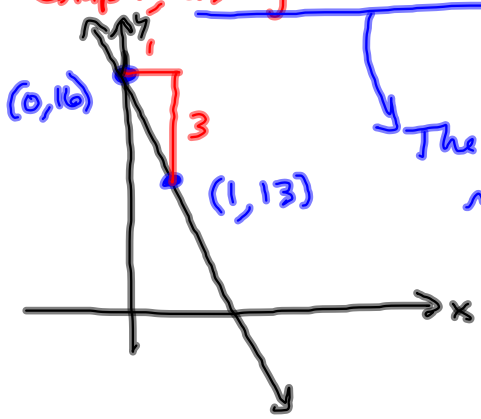
Continuing with standard manipulation to obtain it from previous:

$$y-25=-3(x+3)$$
$$y-25=-3x-9$$
$$y=\underbrace{-3}_{m=-3}x+\underbrace{16}_{(0,16)\text{ is y-int.}}$$

Graph, using the slope & y-intercept.

The only time I don't need to see x-intercept.

$m=-3=\frac{-3}{1}=\frac{\text{Down }3}{\text{Right }1}$



$y = -3x + 16$

write in Standard form:

$$Ax + By = C$$

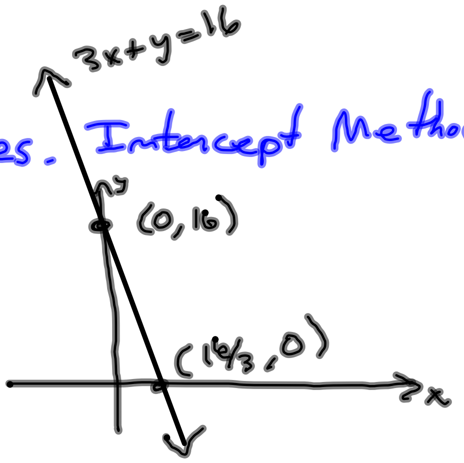
$$
\begin{array}{rcl}
y &=& -3x + 16 \\
+3x && = +3x \\
\hline
3x + y &=& 16
\end{array}
$$

Nice for sketches. Intercept Method.

x	y
0	16
$\frac{16}{3}$	0

$y = 16$

$3x = 16 \Rightarrow x = \frac{16}{3}$



Find an equation of the line through
(-2,5), (3,-11) & Graph it.

(1) POINT-SLOPE FORM
(2) SLOPE-INTERCEPT FORM
(3) STANDARD FORM

Find Standard Form of the equation of the circle:

$$x^2+y^2+10x-4y=-13$$