The Pythagorean Theorem Part 2

Sunday, June 22, 2014
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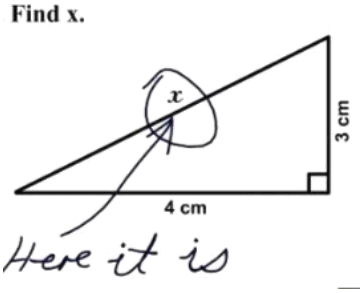
Goals:

1. To find the distance and midpoint between two points in a plane.
2. To find the equation of a circle given the center and radius.
3. To find the center, radius, and graph of a given circle's equation.

Joke (don't do this!)



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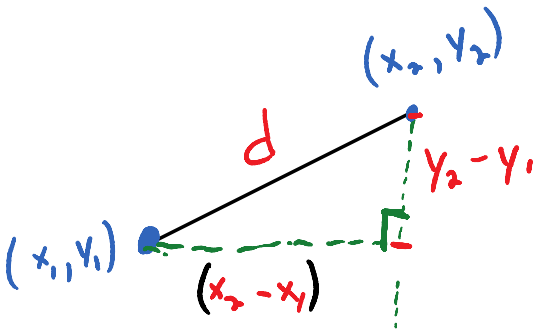
Distance Formula



$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

Ex. Find the distance between the points whose coordinates are given.

(-5, 8), (-11, 12)

$$d = \sqrt{(-11-(-5))^2 + (12-8)^2}$$

$$d = \sqrt{(-6)^2 + 4^2}$$

$$d = \sqrt{36+16}$$

$$d = \sqrt{52}$$

$$= 2\sqrt{4 \cdot 13}$$

$$= 2\sqrt{13}$$

midpoint Formula

(x_1, y_1) (x_2, y_2)

$$\text{midpoint} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

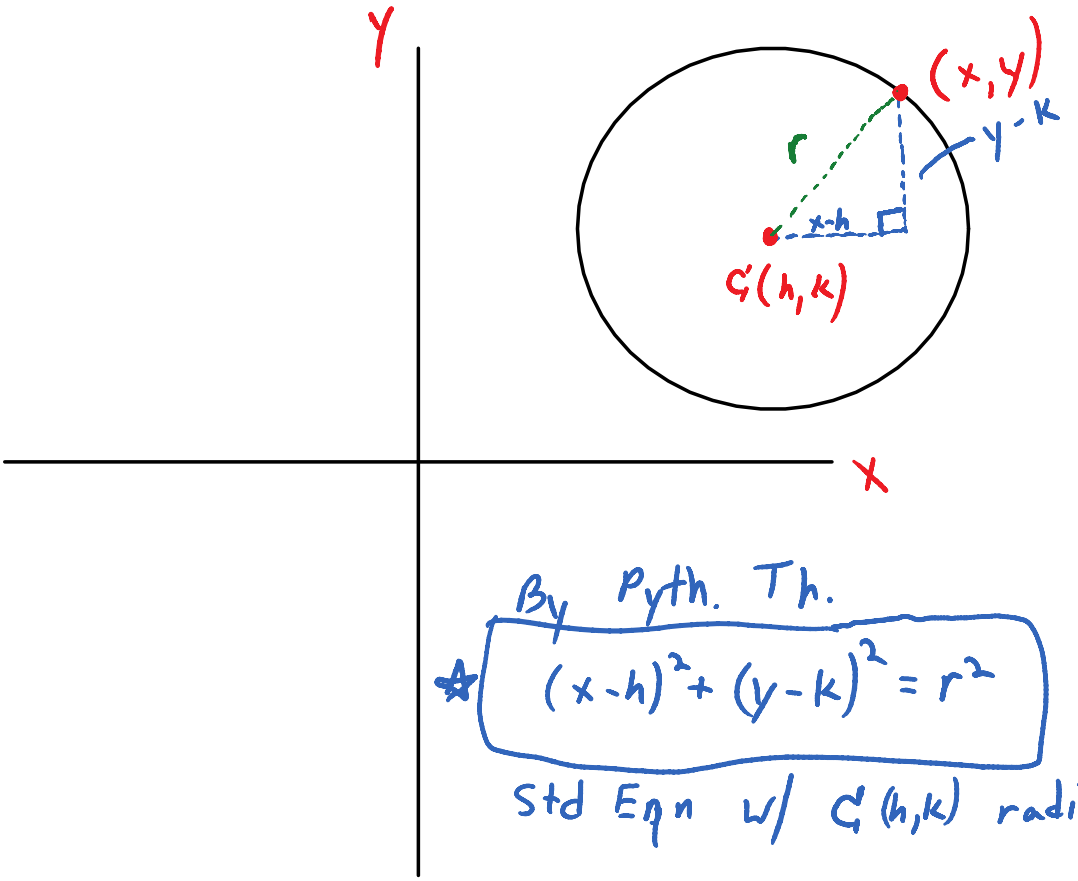
Ex. Find the midpoint of the line segment having the given endpoints.

(5, -5), (9, 9)

$$\text{M.P.} = (\bar{x}, \bar{y}) = \left(\frac{5+9}{2}, \frac{-5+9}{2}\right)$$

$= (7, 2)$

Standard Eqn. of a circle



By Pyth. Th.

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

Std Eqn w/ C(h,k) radius = r

Ex. Determine the center and radius of the circle with the given equation.

a) $(x - 1)^2 + y^2 = \frac{1}{36}$

$(x-1)^2 + (y-0)^2 = \left(\frac{1}{6}\right)^2$

$C(1,0)$ $\quad r = \frac{1}{6}$

b) $(x+5)^2 + (y+10)^2 = 5$

$(x-(-5))^2$

$C(-5, -10)$

$r = \sqrt{5}$

Unit Circle

$x^2 + y^2 = 1$

$C(0,0)$, $r = 1$

Ex. Find an equation of a circle that satisfies the given conditions. Write your answer in standard form.

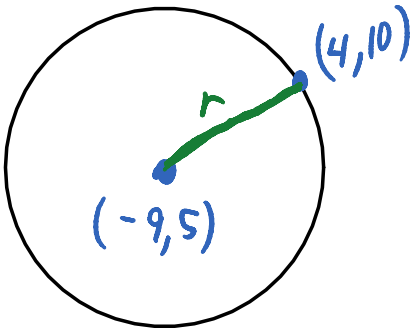
Center $\left(0, \frac{4}{7}\right)$, radius $\sqrt{65}$

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

$x^2 + \left(y - \frac{4}{7}\right)^2 = 65$

Ex. Find an equation of a circle that satisfies the given conditions. Write your answer in standard form.

Center $(-9, 5)$, passing through $(4, 10)$



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

$$r=\sqrt{(4+9)^2+(10-5)^2}$$

$$r=\sqrt{169+25}$$

$$r=\sqrt{194}$$

~~194~~

r

$$(x+9)^2+(y-5)^2=194$$

Review

Quadratic Functions

$$f(x)=a(x-h)^2+k$$

$$V(h,k)$$

(ex) $f(x)=2(x-1)^2-3$

$V(1,-3)$