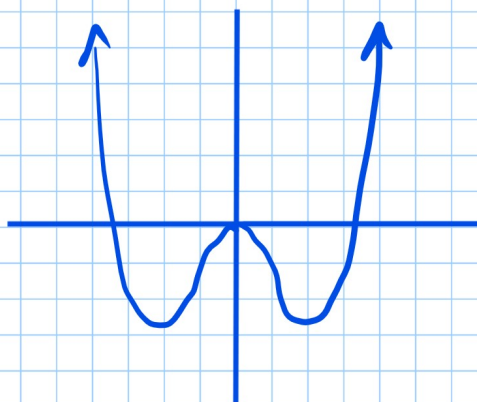


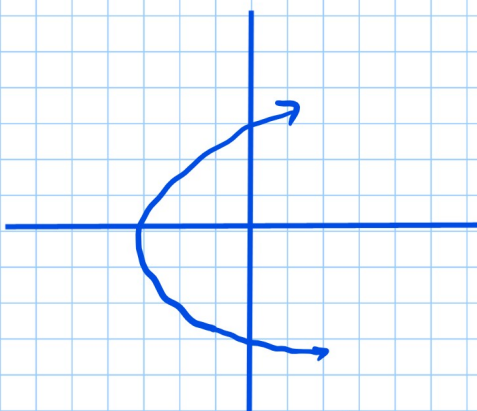
Good Morning! Happy Monday!

Warmup

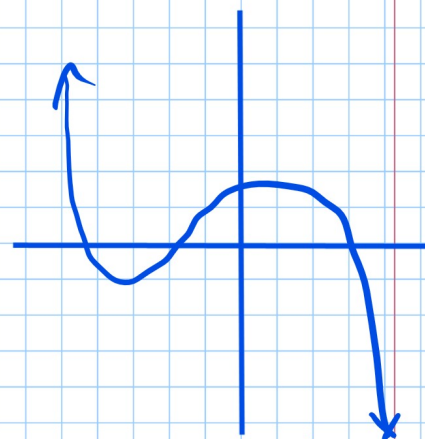
What type of symmetry does each of the following have?



y-axis symmetry



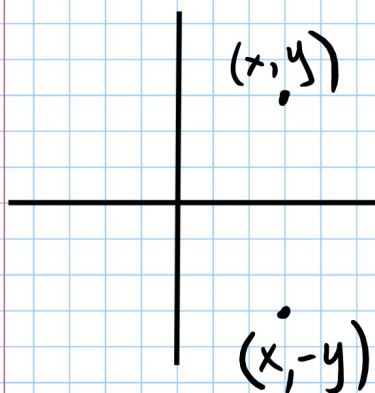
x-axis symmetry



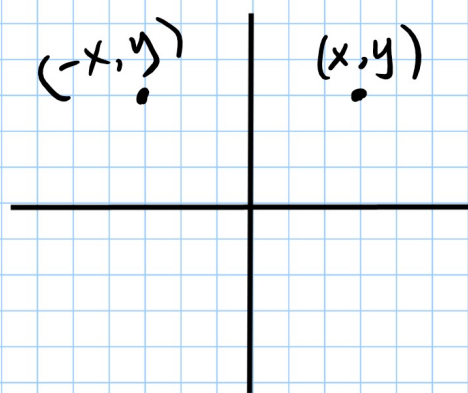
no symmetry

## Section 1.3 Symmetry and Circles

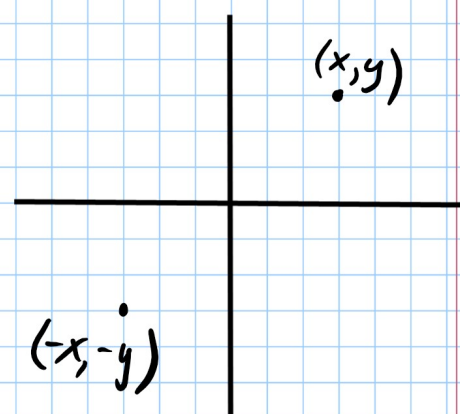
x-axis



y-axis



origin



## Tests for Symmetry

x-axis: Replace  $y$  with  $-y$ . If same equation results, you have x-axis symmetry.

y-axis: Replace  $x$  with  $-x$ . If same equation results, you have  $y$ -axis symmetry.

origin: Replace  $x$  with  $-x$  and  $y$  with  $-y$ . If same equation results the graph has origin symmetry.

ex: Test  $y = \frac{3x^4}{x^2 - 5}$  for symmetry.

x-axis

$$-y = \frac{3x^4}{x^2 - 5}$$

no x-axis  
symmetry

different

same

y-axis

$$y = \frac{3(-x)^4}{(-x)^2 - 5}$$

$$y = \frac{3x^4}{x^2 - 5}$$

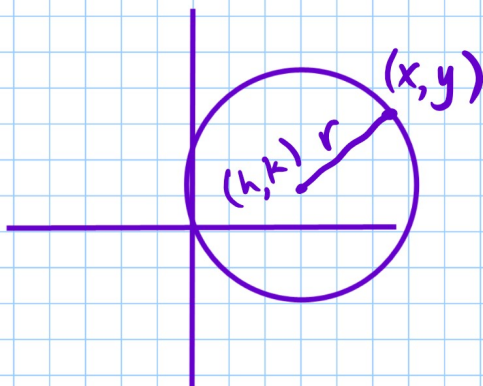
yes y-axis symmetry

origin

$$-y = \frac{3(-x)^4}{(x)^2 - 5}$$

$$-y = \frac{3x^4}{x^2 - 5}$$

No!



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

Standard Form of Equation of a Circle

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

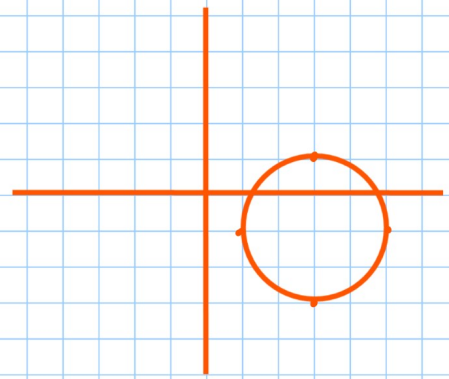
$(h, k)$  = center

$r$  = radius

Graph  $(x-3)^2 + (y+1)^2 = 4$

Center =  $(3, -1)$

$r^2 = 4 \Rightarrow r = 2$



The equation of the unit circle is  $x^2 + y^2 = 1$

Center =  $(0, 0)$

$r = 1$

ex: Find center and radius of circle with equation

$$x^2 + y^2 - 4x + 10y - 7 = 0$$

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

$$x^2 - 4x + 4 + y^2 + 10y + 25 = 7 + 4 + 25$$

$$\frac{-4}{2} = -2$$

$$\frac{10}{2} = 5$$

$$(-2)^2 = 4$$

$$5^2 = 25$$

"toughie"

$$(x-2)^2 + (y+5)^2 = 36$$

center =  $(2, -5)$  ;  $r = 6$

p31-32 12-33 multiples of 3, 39-57 multiples of 3, 63, 67, 77

General Form:  $x^2 + y^2 + ax + by + c = 0$

$$33) y = \frac{x}{x^2 + 9}$$

origin

$$-y = \frac{-x}{(-x)^2 + 9}$$

$$-y = \frac{-x}{x^2 + 9}$$

$$+y = + \frac{x}{x^2 + 9}$$

$$y = \frac{x}{x^2 + 9}$$

$$\frac{8}{-2} = \frac{-8}{2} = -\frac{8}{2}$$