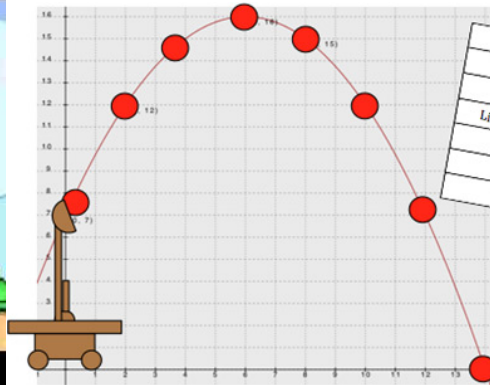


Parabolas

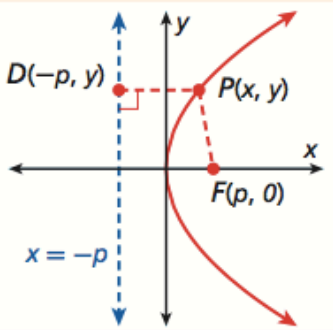
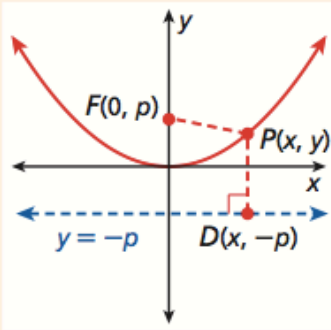
10.5



parabola is the set of all points P in a plane that are equal distance from both a fixed point, (focus) and a fixed line, the **directrix**.

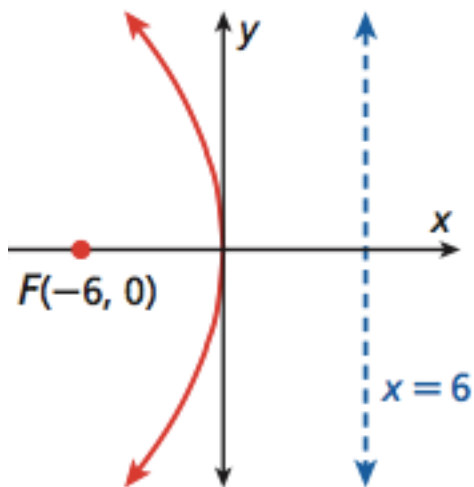
The **vertex** is in the middle of the line from the directrix to focus.

Standard Form for the Equation of a Parabola Vertex at (0, 0)

AXIS OF SYMMETRY	HORIZONTAL $y = 0$	VERTICAL $x = 0$
Equation	$x = \frac{1}{4p}y^2$	$y = \frac{1}{4p}x^2$
Direction	Opens right if $p > 0$ Opens left if $p < 0$	Opens upward if $p > 0$ Opens downward if $p < 0$
Focus	$(p, 0)$	$(0, p)$
Directrix	$x = -p$	$y = -p$
Graph		

Example 1

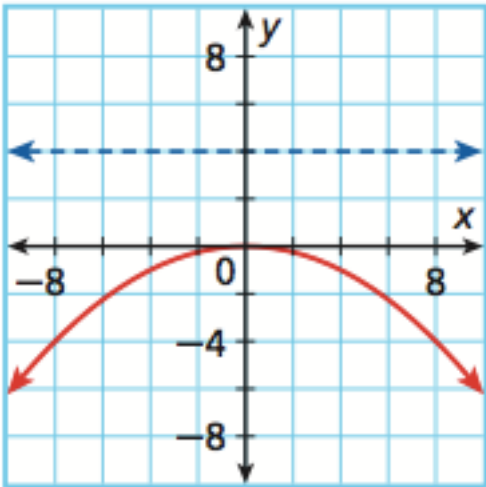
Write the equation in standard form for the parabola.



Axis of Symmetry	$y = 0$ Horizontal $x = \frac{1}{4p}y^2$
Focus value, p	Vertex is at $(0,0)$ Directrix is at $x=6$ $x = -p$ $p = -6$
Plug in “ p ” into equation	$x = \frac{1}{4(-6)}y^2$

$$x = \frac{1}{-24}y^2$$

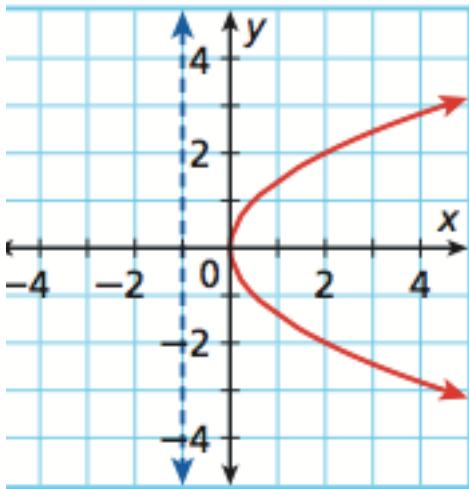
Try:
Write the equation in standard form.



Axis of Symmetry	
Solve for p	Vertex is at Directrix is at p =
Plug in "p" into equation	

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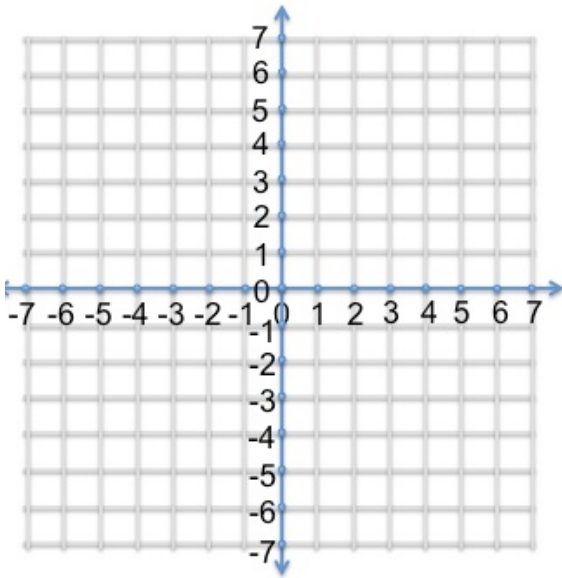
Try:
Write the equation in standard form.



Axis of Symmetry	
Solve for p	Vertex is at Directrix is at

	p =
Plug in "p" into equation	

ou Try in your notebooks
dd talk, Even write:
rite the equation in standard form.



Axis of Symmetry	
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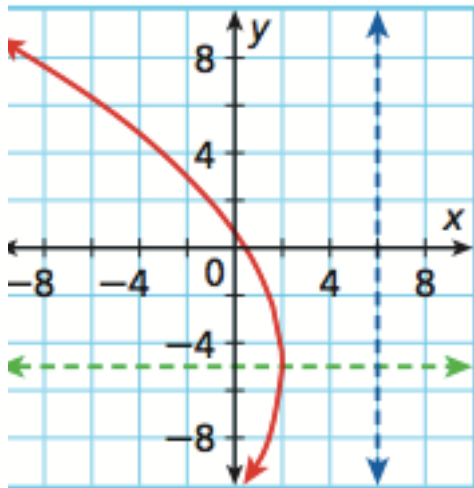
Solve for p	Vertex is at Directrix is at p =
Plug in "p" into equation	

asmos

Standard Form for the Equation of a Parabola		Vertex at (h, k)
AXIS OF SYMMETRY	HORIZONTAL $y = k$	VERTICAL $x = h$
Equation	$x - h = \frac{1}{4p}(y - k)^2$	$y - k = \frac{1}{4p}(x - h)^2$
Direction	Opens right if $p > 0$ Opens left if $p < 0$	Opens upward if $p > 0$ Opens downward if $p < 0$
Focus	$(h + p, k)$	$(h, k + p)$
Directrix	$x = h - p$	$y = k - p$
Graph		

Try.

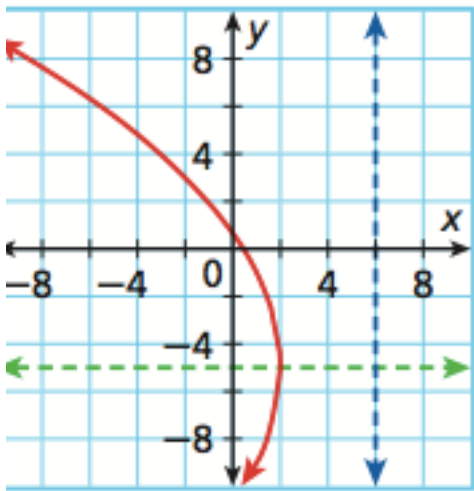
Write the equation in standard form.



Axis of Symmetry	$Y = -5$ Horizontal $x - h = \frac{1}{4p}(y - k)^2$
Solve for h,k,p	Vertex is at (2,-5) $h = 2, k = -5$

	Directrix is at $x=6$ $x=h-p$ $6=2-p$ $4=-p$ $-4=p$
Plug in "h,k,p" into equation	$x - h = \frac{1}{4p} (y - k)^2$ $x - 2 = \frac{1}{4(-4)} (y - (-5))^2$ $x - 2 = \frac{1}{-16} (y + 5)^2$

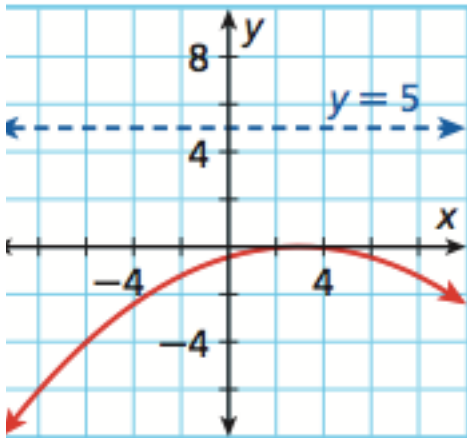
Try:
Write the equation in standard form.



Axis of Symmetry	
Solve for h,k,p	Vertex is at

	$h=$ $k=$ Directrix is at
Plug in "h,k,p" into equation	

You Try:
 Then talk, Odd write:



Axis of Symmetry	
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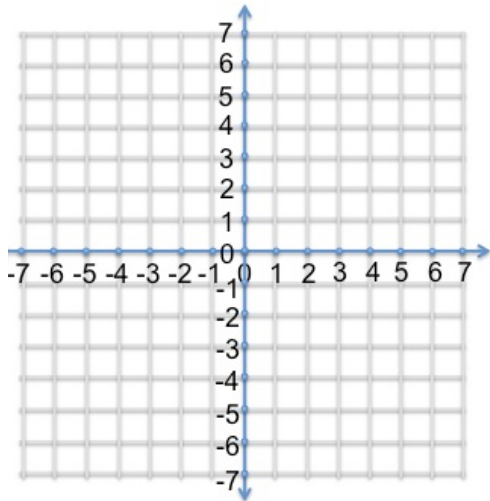
Solve for h,k,p	Vertex is at h= k= Directrix is at
Plug in "h,k,p" into equation	

Example 2

Find the vertex, value of p, axis of symmetry, focus, and directrix, and then graph.

$$y = \frac{1}{32}(x + 2)^2$$

Identify axis of symmetry	Vertical $y - k = \frac{1}{4p}(x - h)^2$
Vertex (h,k)	h=-2 k=0 (-2,0)
p	4p=32 p=8
Focus	(h,k+p) (-2,0+8) (-2,8)
Directrix	y=k-p y=0-8 y=-8

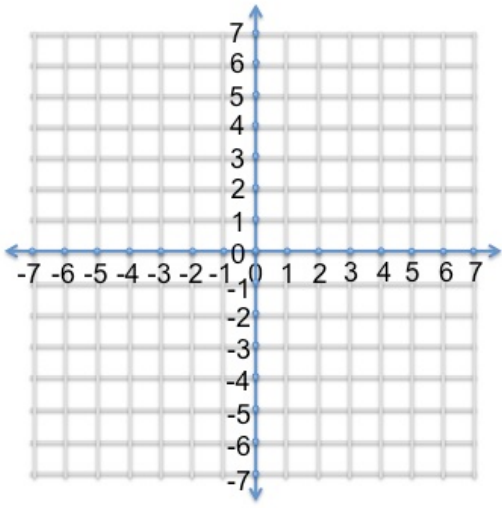


Try:
 Find the vertex, value of p , axis of symmetry, focus, and directrix, and then graph.

$$x = \frac{1}{8} (y - 1)^2$$

Identify axis of symmetry	
Vertex (h,k)	h= k=
p	4p= p=
Focus	
Directrix	

--	--



ou Try in your notebooks with your partner:

ven Write, Odd Talk

nd the vertex, value of p, axis of symmetry, focus, and directrix, and then graph.

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

dentify axis of symmetry	
Vertex (h,k)	h= k=
o	4p= p=
ocus	
irectrix	

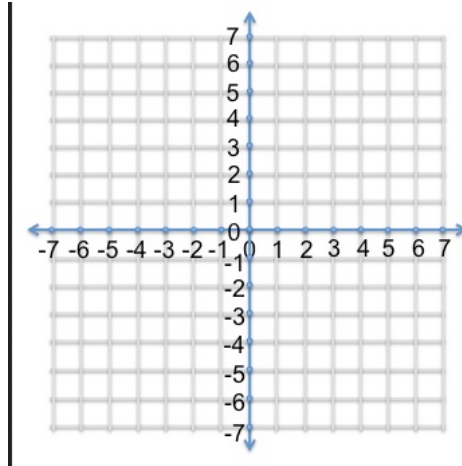
ample 3

Try:

Write the equation in standard form. Find the domain and range.

Vertex $(-7, -3)$, Focus $(2, -3)$

Axis of Symmetry



Horizontal

$$x = \frac{1}{4p}y^2$$

Find h, k, p

$$H = -7, k = -3$$

Focus $(h+p, k)$

$$-7 + p = 2$$

$$p = 9$$

Plug h, k, p into equation

$$x - h = \frac{1}{4p}(y - k)^2$$

$$x - (-7) = \frac{1}{4(9)}(y - (-3))^2$$

$$x + 7 = \frac{1}{36}(y + 3)^2$$

Find the Domain and Range

$$x \geq -7$$

$$y: \mathbb{R}$$

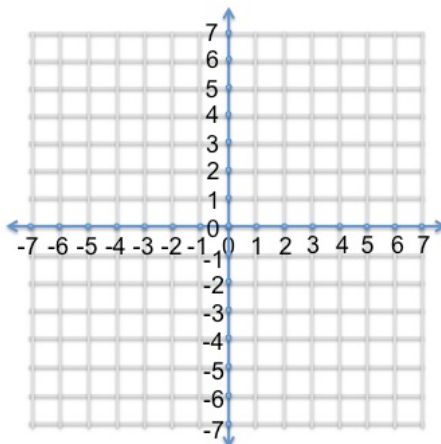
Try:

Write the equation in standard form. Find the domain and range.

Focus (4,-5), Directrix $x = 12$

Axis of Symmetry	Directrix $x = 12$ Horizontal $x - h = \frac{1}{4p}(y - k)^2$
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Find h,k,p



Vertex is halfway between the focus and directrix.

Vertex (8,-5)

$$h=8$$

$$k=-5$$

Focus (h+p,k)

$$4=8+p$$

$$-4=p$$

Plug h,k,p into equation

$$x - h = \frac{1}{4p}(y - k)^2$$

$$x - 8 = \frac{1}{4(-4)}(y - (-5))^2$$

$$x - 8 = \frac{1}{-16}(y + 5)^2$$

Find the Domain and Range

$$x \leq 8$$

$$y: \mathbb{R}$$

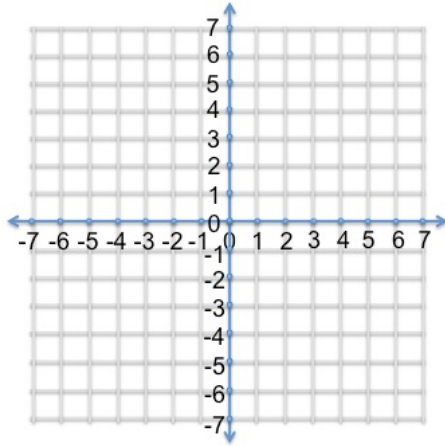
“

Try:

Write the equation in standard form.

Vertex $(0,0)$, Focus $(\frac{1}{2}, 0)$

Axis of Symmetry	
------------------	--



Vertical

$$y = \frac{1}{4p} x^2$$

Find p

Focus (p,0)

p=

Plug p into equation

asure:

scuss these questions with your partner.

ow can we find the vertex given the focus and directrix?

ow can we tell if a parabola is vertical or horizontal?

What are the steps needed to graph a parabola given the equation?