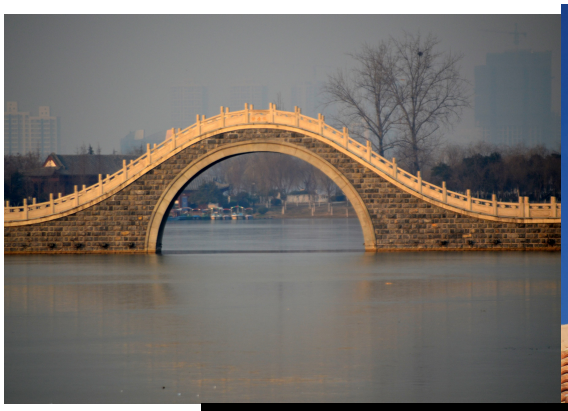
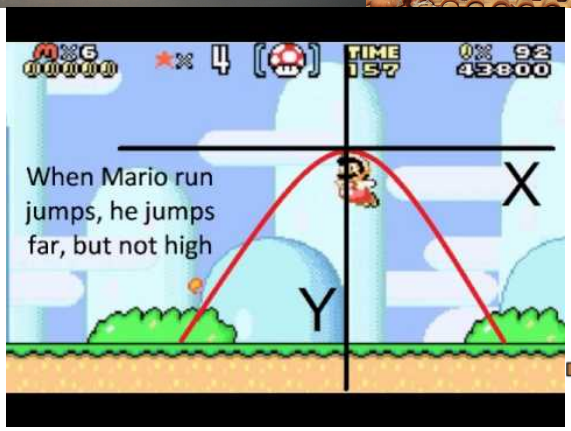
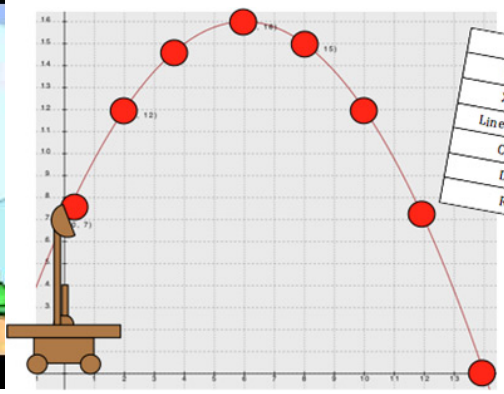
Parabolas
10.5
4.3.17





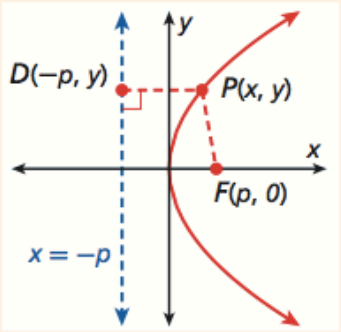
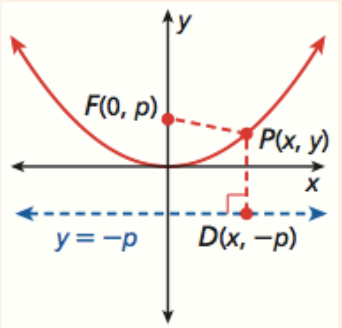


Vertex	
Y-Intercept	
X-Intercept	
Line of Symmetry	
Concavity	
Domain	
Range	

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.**

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

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

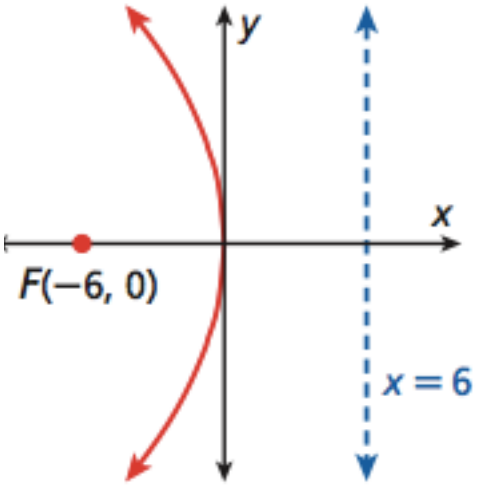
AXIS OF SYMMETRY	HORIZONTAL $y = 0$	VERTICAL $x = 0$
Equation	$x = \frac{1}{4p}y^2$	$y = \frac{1}{4p}x^2$
Direction	Opens right if $p > 0$ Opens left if $p < 0$	Opens upward if $p > 0$ Opens downward if $p < 0$
Focus	$(p, 0)$	$(0, p)$
Directrix	$x = -p$	$y = -p$
Graph		

g. 752

‹ample 1

:ry.

/rite the equation in standard form for the parabola.

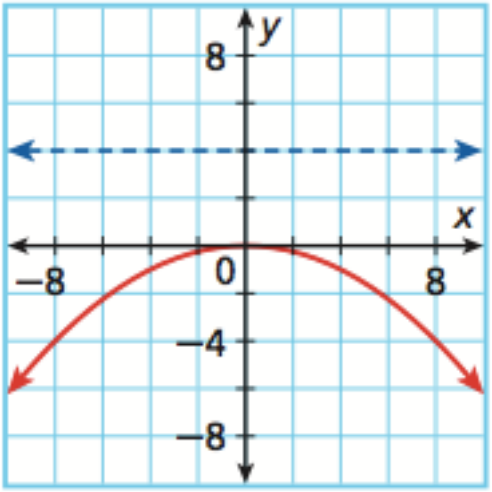


Axis of Symmetry	y = 0 Horizontal $x = \frac{1}{4p}y^2$
Focus value, p	Vertex is at (0,0) Directrix is at x=6 x = -p p =-6
Plug in “p” into equation	$x = \frac{1}{4(-6)}y^2$ $x = \frac{1}{-24}y^2$

/e Try:

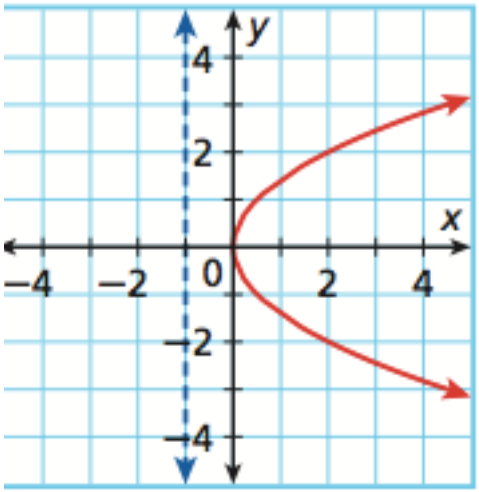
/rite the equation in standard form.

.



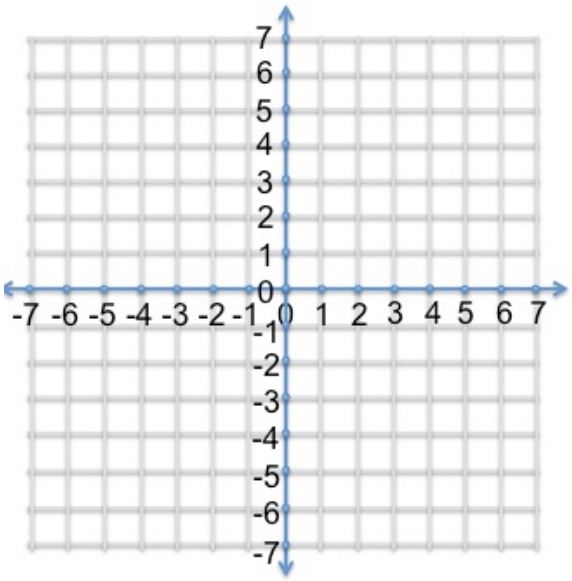
Axis of Symmetry	
Solve for p	Vertex is at Directrix is at p =
Plug in “p” into equation	

/e Try:
/rite the equation in standard form.



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

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

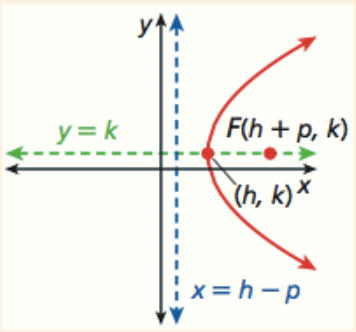
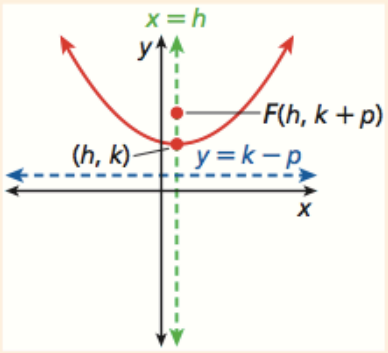


Axis of Symmetry	
Solve for p	Vertex is at Directrix is at p =

Plug in “p” into equation	

esmos

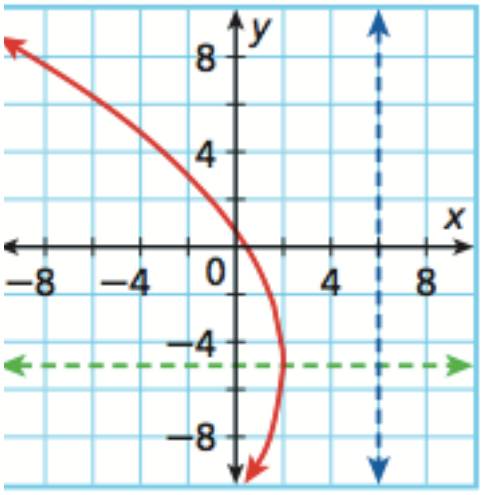
tandard Form for the Equation of a Parabola — **Vertex at (h, k)**

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		

g.753

Try.

Write the equation in standard form.

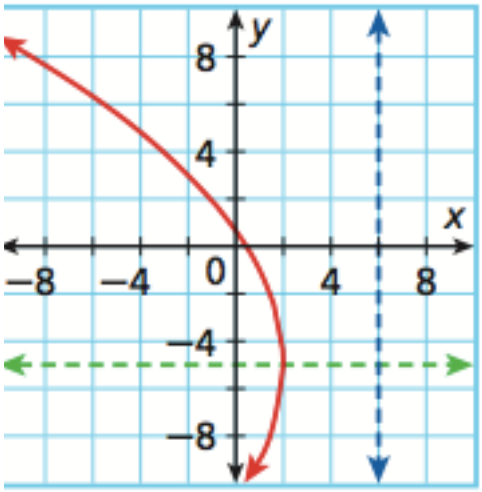


Axis of Symmetry	Y=-5 Horizontal $x - h = \frac{1}{4p}(y - k)^2$
Solve for h,k,p	Vertex is at (2,-5) h=2, k=-5 Directrix is at x=6 x=h-p 6=2-p 4=-p -4=p

Plug in “h,k,p” into equation	$x-h=\frac{1}{4p}(y-k)^2$ $x-2=\frac{1}{4(-4)}(y-(-5)^2$ $x-2=\frac{1}{-16}(y+5)^2$

We Try:

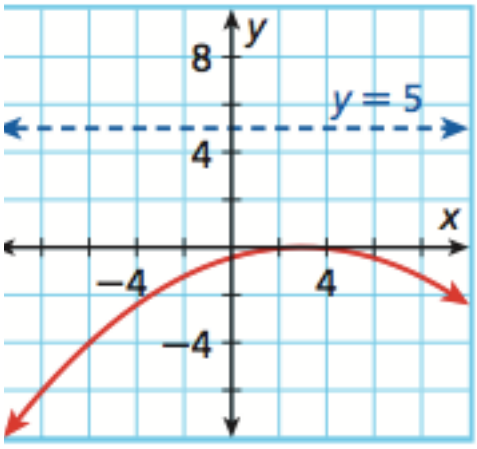
/rite the equation in standard form.



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

Plug in “h,k,p” into equation	

ɔu Try:
ɹen talk, Odd write:



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

Plug in “h,k,p” into equation	

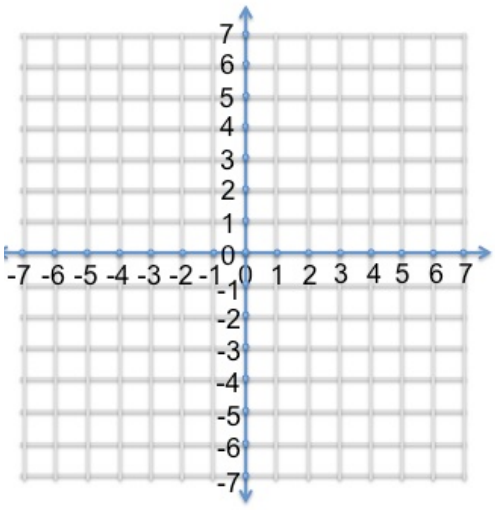
‹ample 2

nd 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



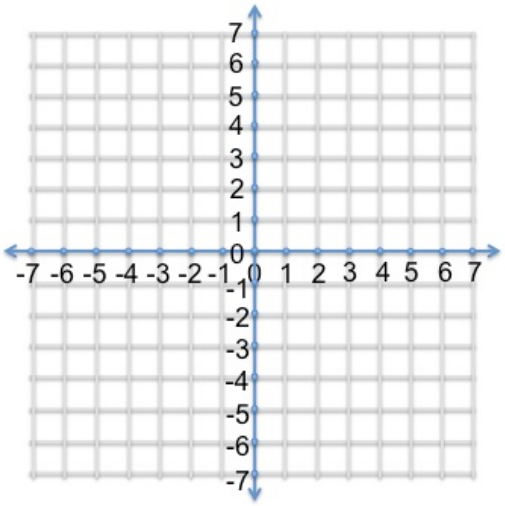
/e Try:

nd 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	



ɔu 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.

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

Identify axis of symmetry	
Vertex (h,k)	h= k=
p	4p= p=
focus	
directrix	

ɤample 3

Γry:

/rite the equation in standard form. Find the domain and range.

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

Axis of Symmetry	Horizontal $x - h = \frac{1}{4p}(y - k)^2$
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: 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 $x - h = \frac{1}{4p}(y - k)^2$
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: R

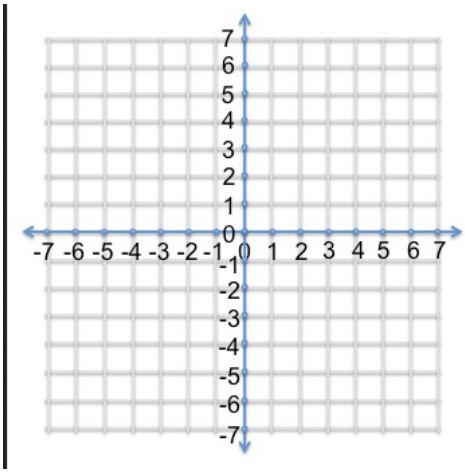
,,

/e Try:

/rite the equation in standard form.

dd Write Even Talk

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

Axis of Symmetry	
Find p	Focus (p,0) p=

Plug p into equation	

losure:

iscuss these questions with your partner.

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

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

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