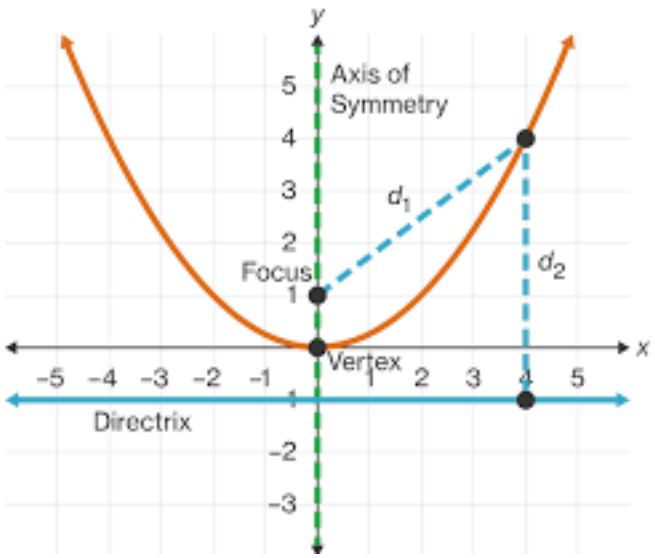
Section 10.5

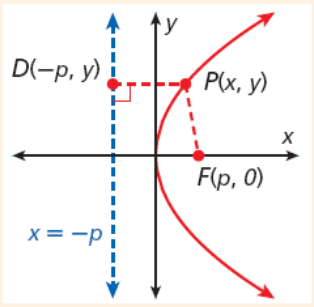
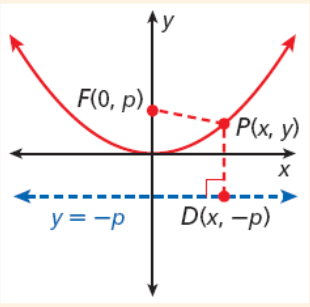
Parabolas

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



- A parabola has an **axis of symmetry** perpendicular to its directrix and that passes through its vertex.
- The **vertex** of a parabola is the midpoint of the perpendicular segment connecting the focus and the directrix.
- "p" is the distance from the vertex to the focus.
- "-p" is the distance/direction from the vertex to the directrix.

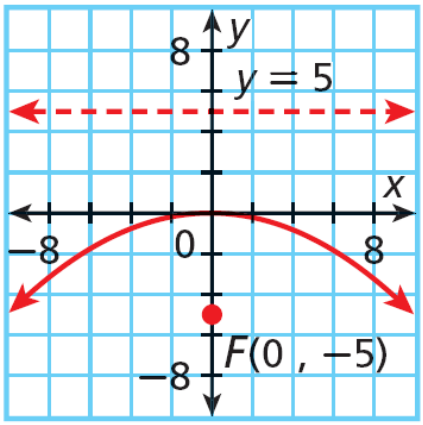
Standard Form for the Equation of a Parabola — Vertex at (0, 0)

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		

Section 10.5

Example #1: Write the equation of the parabola given the following information:
vertex (0, 0), directrix $x = -6$

Example #2:
Write the equation in standard form for the parabola.



When the center moves:

AXIS OF SYMMETRY	HORIZONTAL $y = k$	VERTICAL $x = h$
Equation	$x - h = \frac{1}{4p}(y - k)^2$	$y - k = \frac{1}{4p}(x - h)^2$
Directrix	$x = h - p$	$y = k - p$

Example #3: **Find the vertex, value of *p*, axis of symmetry, focus, and directrix of the parabola $y + 3 = \frac{1}{8}(x - 2)^2$. Then graph.**

You try: $x - 1 = \frac{1}{12}(y - 3)^2$