Warm Up

Complete the square to put in vertex form.

$$y = 2x^2 + 10x + 3$$

$y - 3 = 2x^2 + 10x$

$y - 3 + 2\left(\frac{25}{4}\right) = 2\left(x^2 + \frac{5}{2}x + \frac{5}{2}^2\right)$

$y - \frac{6}{2} + \frac{25}{2} = 2\left(x + \frac{5}{2}\right)^2$

$y + \frac{19}{2} = 2\left(x + \frac{5}{2}\right)^2$

$y = 2(x + 5/2)^2 - \frac{19}{2}$

$V\left(-5/2, -\frac{19}{2}\right)$

Nov 6-10:59 AM

10.2 Parabolas

Standard Form $y = ax^2 + bx + c$ (general form in book)

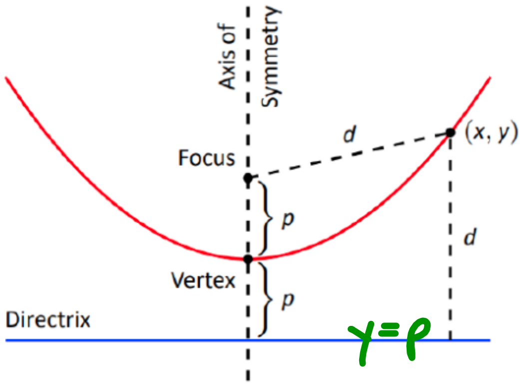
Vertex Form

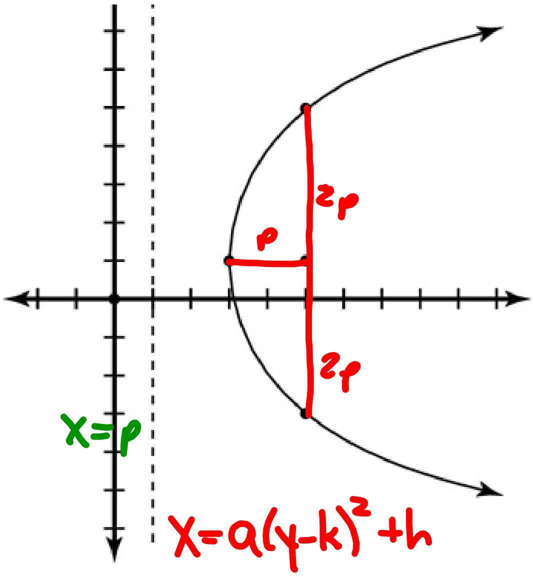
$y = a(x-h)^2 + k$ (book calls this standard)

Nov 6-11:00 AM

Definition of Parabola

A **parabola** is the set of all points (x, y) in a plane that are equidistant from a fixed line (**directrix**) and a fixed point (**focus**) not on the line.





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

$(h, k) = \text{vertex}$

a = vertical stretch/shrink

$-a$ = reflection over x-axis

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

$V = (h, k)$

a = horizontal stretch/shrink

$-a$ = reflection over y-axis

Nov 8-11:43 AM

Focal Chord - a line segment with endpoints on the parabola through the focus.

Latus Rectum - a focal chord parallel to the directrix and perpendicular to the axis of symmetry. Its $length = \frac{1}{a}$ $= 4p$

To find distance from V⟶F & V⟶D use

$$p = \frac{1}{4a}$$

Nov 29-6:27 PM

Example

Find the vertex, focus and directrix for

$$y = \frac{-1}{12}x^2$$

Then sketch the graph

$V(0,0)$

$a = \frac{1}{12}$

$p = \frac{1}{4(\frac{1}{12})}$

$p = \frac{1}{\frac{1}{3}}$

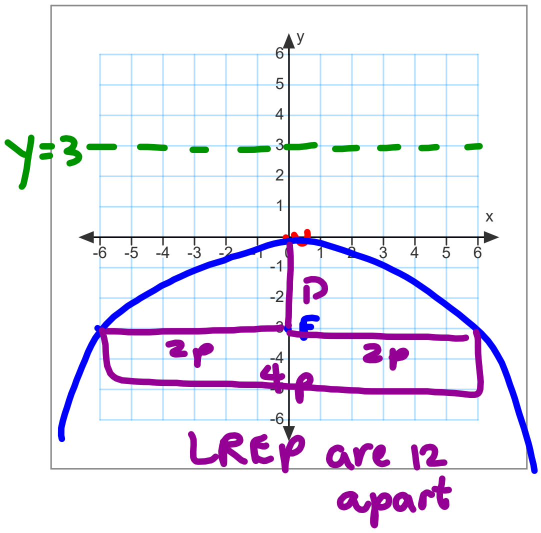
$p = 3$

opens down

$V(0,0)$

$F(0,-3)$ -3

D $y = 3$ $+3$



Nov 8-12:11 PM

Find the equation of the parabola whose vertex is (3, 2) and focus is (1, 2).

Sketch the parabola.

$2\left\{\begin{array}{l} V(3,2) \\ F(1,2) \end{array}\right.$

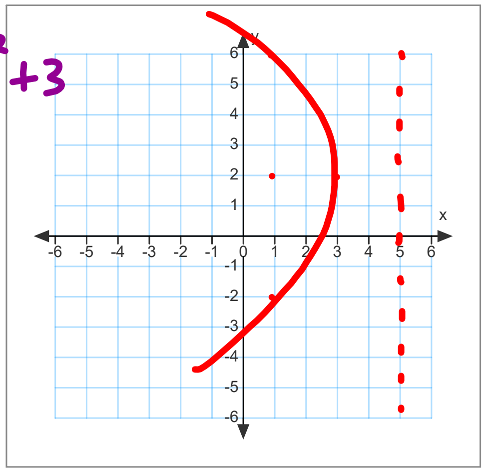
$x = -\frac{1}{8}(y-2)^2 + 3$

$p = 2$ opens left

$2 = \frac{1}{4a}$

$8a = 1$

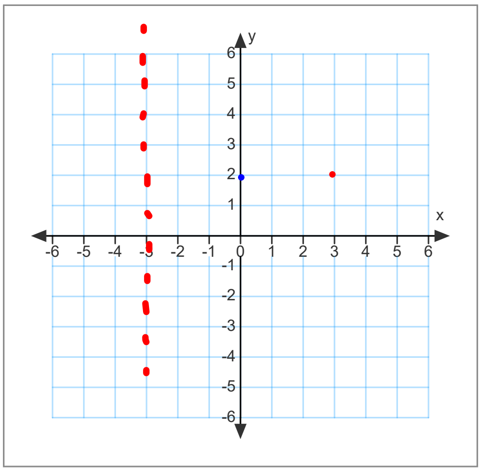
$a = \frac{1}{8}$



Nov 29-6:31 PM

Find the equation of the parabola whose focus is (3, 2) and directrix is x = -3.

$x = \frac{1}{12}(y-2)^2$



Nov 29-6:35 PM

State the vertex, focus and directrix of the parabola $x = -\frac{1}{4}(y-2)^2 + 3$

V(3,2)

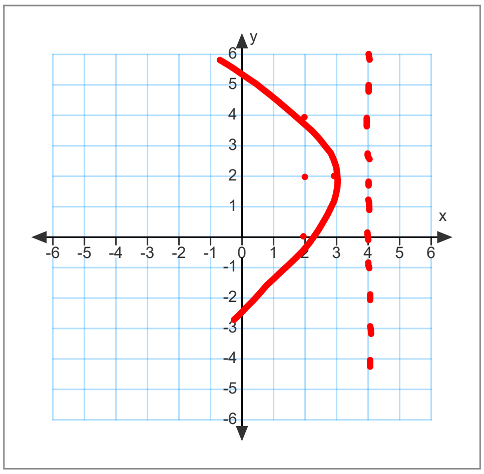
-1 F(2,2)

+1 D x=4

$p = \frac{1}{4(\frac{1}{4})}$

$= 1$

opens left



Nov 29-6:36 PM

State the focus of the parabola

$$y=-\frac{1}{6}\left(x^2+4x-2\right)$$

$y-\frac{1}{3}+\left(-\frac{1}{6}\right)4 = -\frac{1}{6}(x^2+4x+2^2)$

$y-\frac{1}{3}-\frac{2}{3} = -\frac{1}{6}(x+2)^2$

$y-1$

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

$V(-2,1)$

$p=\frac{1}{4(1/6)}$

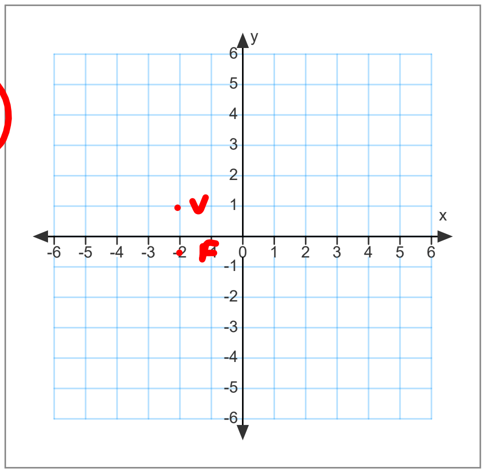
$=\frac{1}{\frac{4}{6}}$

$=\frac{3}{2}$

$-\frac{3}{2}$

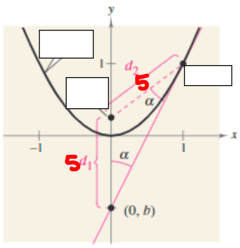
$F(-2,-\frac{1}{2})$

Opens down



Nov 29-6:39 PM

Find the equation of line tangent to the parabola $y=\frac{1}{2}x^2$ through the point $\left(3,\frac{9}{2}\right)$.



Find focus:

$p=\frac{1}{4(\frac{1}{2})}=\frac{1}{2}$

$F(0,\frac{1}{2})$ pt $(3,\frac{9}{2})$

Find d_2

$\sqrt{3^2+4^2}$

$=5$

$\therefore d_1=5$

$F(0,\frac{1}{2})$ y-int $(0,b)$

$\sqrt{0^2+(\frac{1}{2}-b)^2}=5$

$\sqrt{(\frac{1}{2}-b)^2}$

$\frac{1}{2}-b=5$

$-b=\frac{9}{2}$

$b=-\frac{9}{2}$

Find slope: $(0,-\frac{9}{2})(3,\frac{9}{2})$

$m=\frac{-9}{-3}=3$

Equation: $y=3x-\frac{9}{2}$

Apr 13-2:18 PM

HOMEWORK

p 740 5-10,

15, 19-25 odd, (get in alternate form first!) 33, 35, 41, 45-49 odd,

55, 57 (in slope intercept form), 61, 63

due Monday 4/8

Feb 2-9:51 PM

	$y = a(x-h)^2 + k$	$y = a(y-k)^{-} + h$
Vertex	(h,k)	(h,k)
Axis of Symmetry	$x = h$	$y = k$
Focus	$(h, k + \frac{1}{4a})$	$(h + \frac{1}{4a}, k)$
Directrix	$y = k - \frac{1}{4a}$	$x - h - \frac{1}{4a}$
LR	$\left\lvert \frac{1}{a} \right\rvert$	$\left\lvert \frac{1}{a} \right\rvert$

Nov 8-12:14 PM

HOMEWORK

p 667 5-9 odd, 11, 23-31 odd

37-42 all (get in alternate form), 51, 53

57-63 odd, 69, 77-81 odd

Aug 29-6:38 AM