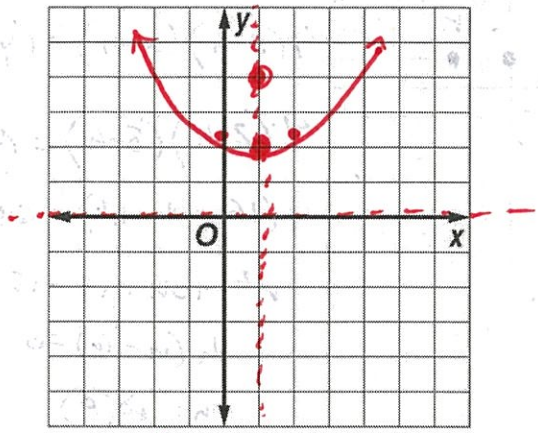
Pre-Calculus
Section 7.1: Parabolas Homework

Name: Key

For numbers 1 & 2, identify the vertex, focus, axis of symmetry, and directrix for each equation. Then graph the parabola.

1. $(x-1)^2 = 8(y-2)$ up



h: 1
k: 2
p: 2

x	y
0	2.125
2	2.125

same

$2\frac{1}{8}$ or $\frac{17}{8}$

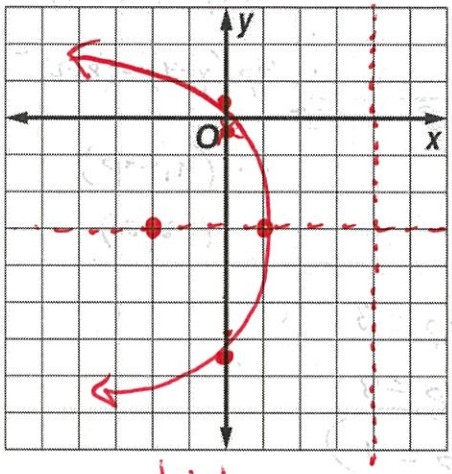
Vertex: (1, 2)

Focus: (1, 4)

Axis of symmetry: $x = 1$

Directrix: $y = 0$

2. $y^2 + 6y + 9 = 12 - 12x$ ↓ L/R



h: 1
k: -3
p: -3

Vertex: (1, -3)

Focus: (-2, -3)

Axis of symmetry: $y = -3$

Directrix: $x = 4$

Left

$(y+3)^2 = -12(x-1)$

x	y
0	$-3 \pm 2\sqrt{3}$ or $-6.5, +.5$

$y + 3 = \pm\sqrt{12}$

3. Write $x^2 + 8x = -4y - 8$ in standard form. Identify the vertex, focus, axis of symmetry, and directrix.

$(x+4)^2 = -4y - 8 + 16$

Down $(x+4)^2 = -4(y-2)$

h: -4
k: 2
p: -1

V: (-4, 2)

F: (-4, 1)

A.o.S: $x = -4$

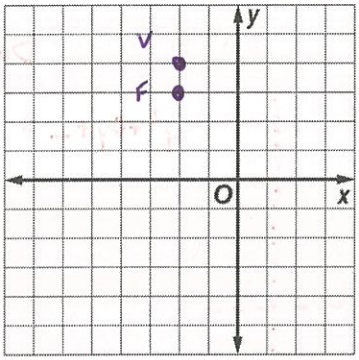
Dtx: $y = 3$

For numbers 4 & 5, write an equation for and graph a parabola with the given characteristics.

$p = 2 - h$

$(h+p, k)$ p ↑

4. vertex (–2, 4); focus (–2, 3)



opens down

$4p(y-k) = (x-h)^2$

$4p(y-4) = (x+2)^2$

$F: (h, k+p)$

$(-2, 3)$

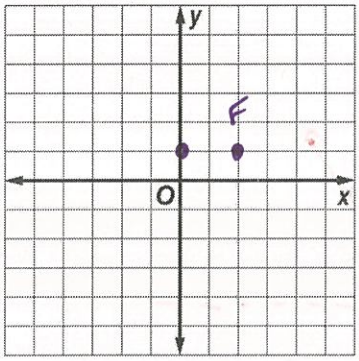
$k+p = 3$

$4+p = 3$

$p = -1$

Equation: $-4(y-4) = (x+2)^2$

5. focus (2, 1); opens right; contains (8, –7)



$4p(x-h) = (y-k)^2$

$4(2-h)(x-h) = (y-1)^2$

$4(2-h)(8-h) = (-8)^2$

$4(16-10h+h^2) = 64$

$h^2 - 10h + 16 - 16 = 0$

$h(h-10) = 0$

$h = 0$

opens right

Then $p = 2$

Equation: $8(x) = (y-1)^2$

6. Suppose the receiver in a parabolic dish antenna is 2 feet from the vertex and is located at the focus. Assume that the vertex is at the origin and that the dish is pointed upward. Find an equation that models a cross section of the dish.

$p = 2$

$V: (0,0)$

$8y = x^2$

7. The figure shows a parabolic reflecting mirror. A cross section of the mirror can be modeled by $x^2 = 16y$, where the values of x and y are measured in inches. Find the distance from the vertex to the focus of this mirror.

$4p$

4 inches

8. **T-SHIRTS** The cheerleaders at the high school basketball game launch T-shirts into the stands after a victory. The launching device propels the shirts into the air at an initial velocity of 32 feet per second. A shirt's distance y in feet above the ground after x seconds can be modeled by $y = -16x^2 + 32x + 5$.

a) Write the equation in standard form.

$-16 + y - 5 = -16(x^2 - 2x + 1)$

$y - 21 = -16(x-1)^2$

$-\frac{1}{16}(y-21) = (x-1)^2$

b) What is the maximum height that a T-shirt reaches?

$V: (1, 21)$ opens down

21 ft