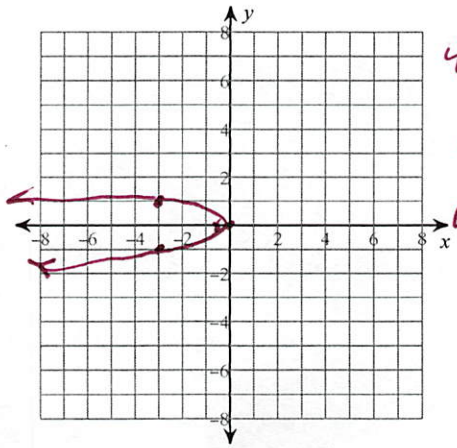
Pre-Calculus Name_____

Parabolas

Date_____ Period____

Identify the vertex, focus, axis of symmetry, directrix, focal length, and direction of opening of each. Then sketch the graph.

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



$4p = -\frac{1}{3}$

$p = -\frac{1}{12}$

opens left

x	y
-3	1
-3	-1

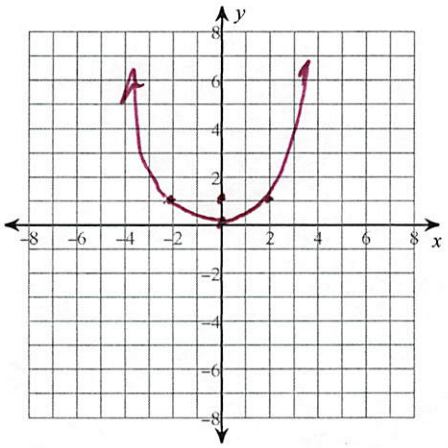
V (0,0) f.l. = $\frac{1}{3}$

f($-\frac{1}{12}$, 0)

a.s: y = 0

directrix: x = $\frac{1}{12}$

2) $4y = x^2$



4 = 4p

p = 1

opens up

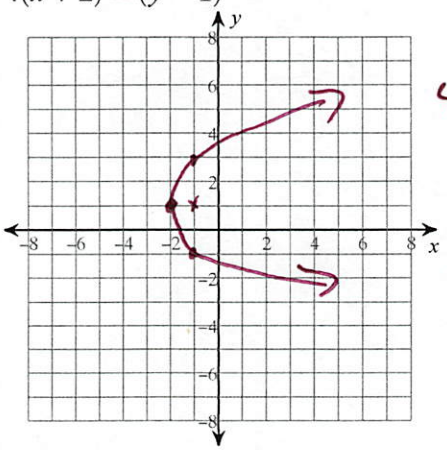
V (0,0) f.l. = 4

f(0,1)

a.s: x = 0

directrix: y = -1

3) $4(x+2) = (y-1)^2$



4 = 4p

p = 1

opens right

V (-2,1)

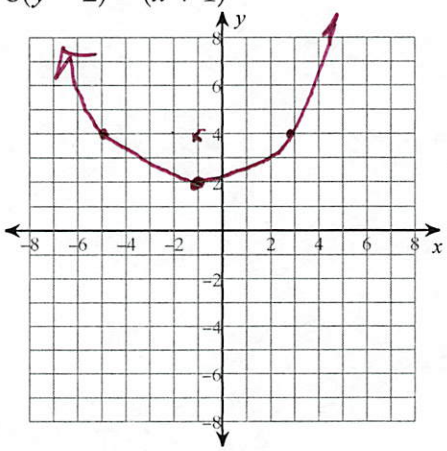
f(-1,1)

f.l. = 4

a.s: y = 1

directrix: x = -3

4) $8(y-2) = (x+1)^2$



8 = 4p

p = 2

opens up

V (-1,2)

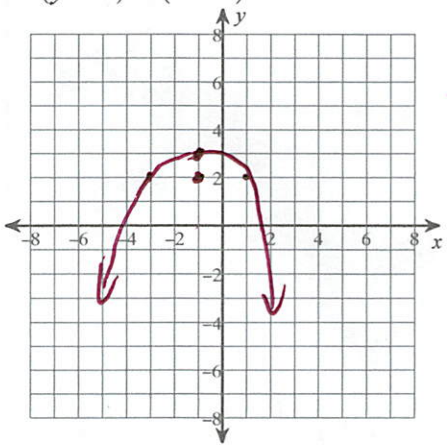
f(-1,4)

f.l. = 8

a.s.: x = -1

directrix: y = 0

5) $-4(y-3)=(x+1)^2$

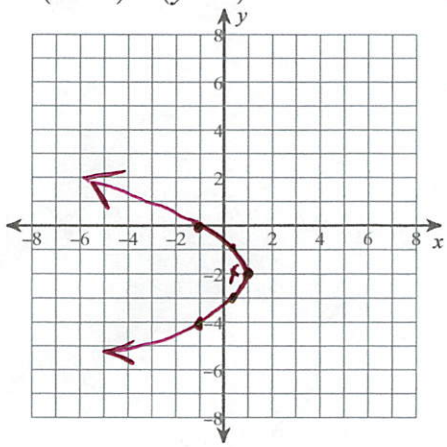


$-4=4p$
$p=-1$
opens down

V(-1,3)
f(-1,2)
f.l. = 4

a.s.: $x=-1$
directrix: $y=4$

6) $-2(x-1)=(y+2)^2$



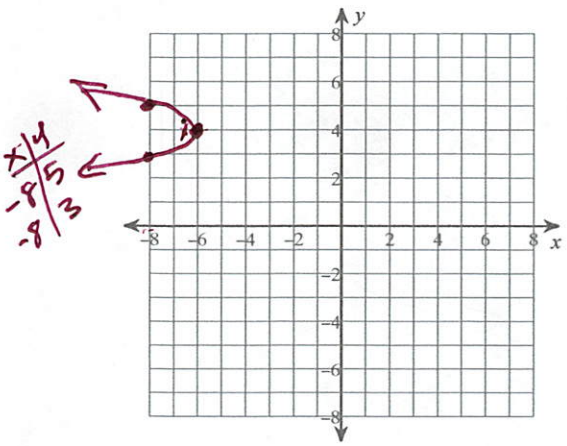
$-2=4p$
$p=-\frac{1}{2}$
opens left

V(1,-2)
$f(\frac{1}{2},-2)$
f.l. = 2

a.s: $y=-2$
directrix: $x=1\frac{1}{2}$

Identify the vertex, focus, axis of symmetry, directrix, and direction of opening of each. Then sketch the graph.

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

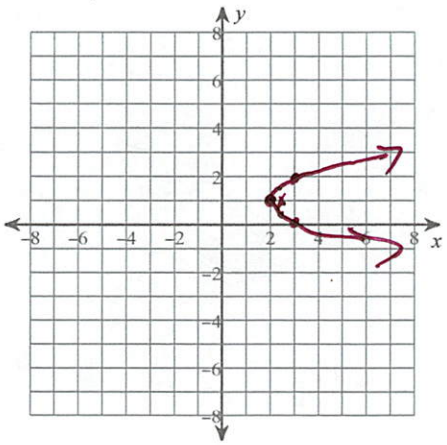


$4p=-\frac{1}{2}$
$p=-\frac{1}{8}$
opens left

V(-6,4)
$f(-6\frac{1}{8},4)$
f.l. = $\frac{1}{2}$

a.s.: $y=4$
directrix: $x=-5\frac{7}{8}$

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



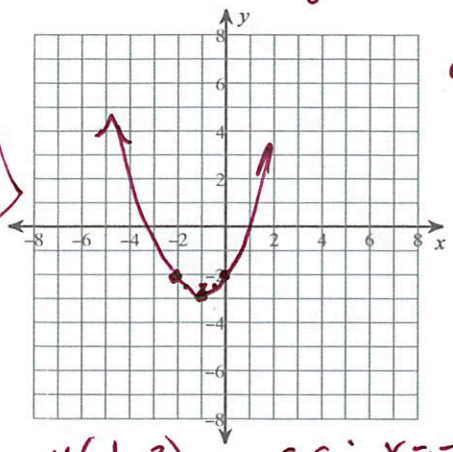
$4p=1$
$p=\frac{1}{4}$
opens right

V(2,1)
$f(2\frac{1}{4},1)$
f.l. = 1

a.s. $y=1$
directrix: $x=1\frac{3}{4}$

Identify the vertex, focus, axis of symmetry, directrix, focal length, and direction of opening of each. Then sketch the graph.

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



x	y
0	-2
-2	-2

$4p = 1$

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

opens up

V(-1, -3)

f(-1, $-2\frac{3}{4}$)

a.s.: $x = -1$

directrix: $y = -3\frac{1}{4}$

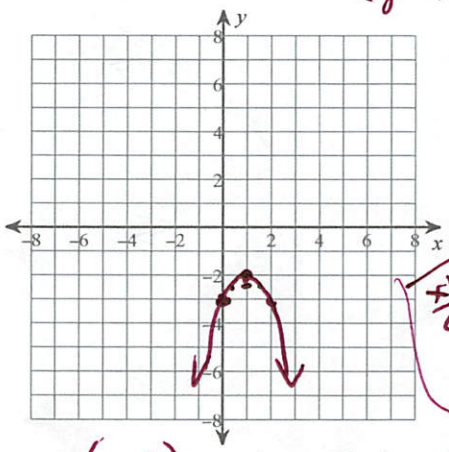
f.l. = 1

10) $y = -(x-1)^2 - 2$ $(y+2) = -(x-1)^2$

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

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

opens down



x	y
0	-3
2	-3

V(1, -2)

f(1, $-2\frac{1}{4}$)

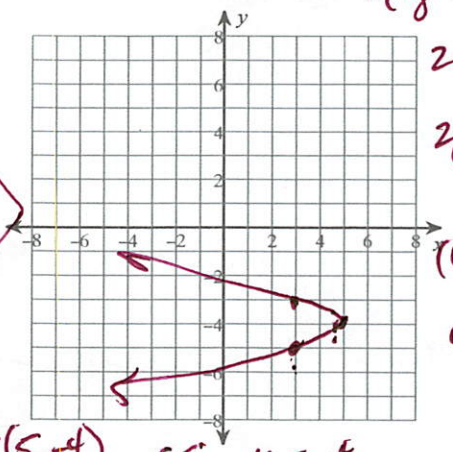
a.s. $x = 1$

directrix: $y = -1\frac{3}{4}$ f.l. = 1

Identify the vertex, focus, axis of symmetry, directrix, and direction of opening of each. Then sketch the graph.

11) $2y^2 + x + 16y + 27 = 0$ $2y^2 + 16y = -x - 27$

$2(y^2 + 8y) = -x - 27$



x	y
3	-3
3	-5

$2(y^2 + 8y + 16) = -x - 27 + 32$

$2(y+4)^2 = -x + 5$

$= -(x-5)$

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

$4p = -\frac{1}{2}$

$p = -\frac{1}{8}$

opens left

V(5, -4)

f($4\frac{7}{8}$, -4)

a.s.: $y = -4$

Directrix: $x = 5\frac{1}{8}$

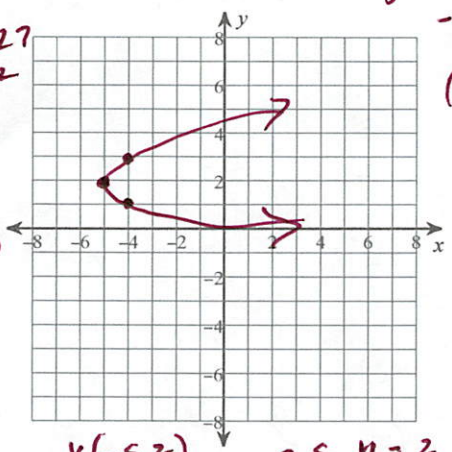
f.l. = $\frac{1}{2}$

12) $-y^2 + x + 4y + 1 = 0$ $-(y^2 - 4y \quad) = -x - 1$

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

$-(y-2)^2 = -x - 5$

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



x	y
-4	1
-4	3

$4p = 1$

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

opens right

V(-5, 2)

f($-4\frac{3}{4}$, 2)

a.s. $y = 2$

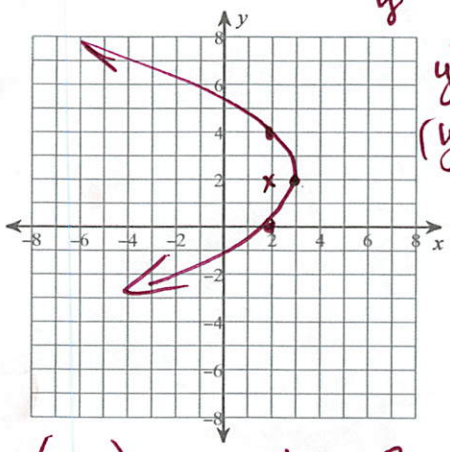
Directrix: $x = -5\frac{1}{4}$

f.l. = 1

13) $y^2 + 4x - 4y - 8 = 0$ $y^2 - 4y = -4x + 8$

$y^2 - 4y + 4 = -4x + 12$

$(y-2)^2 = -4(x-3)$



$4p = -4$

$p = -1$

opens left

V(3, 2)

f(2, 2)

a.s: $y = 2$

directrix: $x = 4$

f.l. = 4

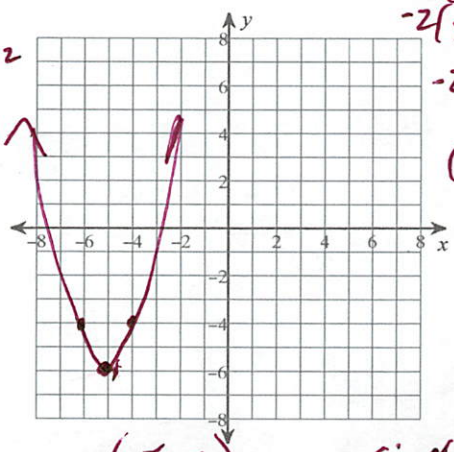
14) $-2x^2 - 20x + y - 44 = 0$ $-2(x^2 + 10x \quad) = -y + 44$

-50

$-2(x^2 + 10x + 25) = -y - 6$

$-2(x+5)^2 = -(y+6)$

$(x+5)^2 = \frac{1}{2}(y+6)$



x	y
-6	-4
-4	-4

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

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

opens up

V(-5, -6)

f(-5, $-5\frac{7}{8}$)

a.s: $x = -5$

directrix: $y = -6\frac{1}{8}$

f.l. = $\frac{1}{2}$

Use the information provided to write the transformational form equation of each parabola.

15) Vertex at origin, Focus: $\left(\frac{7}{24}, 0\right)$

$p = \frac{7}{24}$

$4px = y^2$

$\frac{7}{6}x = y^2$

16) Vertex: $(1, 4)$, Focus: $(1, 9)$

h, k $\quad h, k+p$

$p = 5$

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

$20(y-4) = (x-1)^2$

17) Vertex: $(5, 5)$, Focus: $\left(\frac{27}{5}, 5\right)$

h, k $\quad h+p, k$ $\quad p = 2/5$

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

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

18) Vertex: $(-4, -1)$, Directrix: $y = -\frac{9}{8}$

$y = k - p$

$-\frac{9}{8} = -1 - p$

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

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

$\frac{1}{2}(y+1) = (x+4)^2$

19) Vertex: $(-4, 1)$, Directrix: $y = 0$

$p = 1$

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

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

20) Focus: $\left(7, -\frac{3}{2}\right)$, Directrix: $y = -\frac{1}{2}$

$(7, -1)$

$p = -\frac{1}{2}$

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

$-2(y+1) = (x-7)^2$

21) Opens up or down, Vertex: $(2, -6)$, Passes through: $(0, -2)$

$h \quad k$ $\quad x \quad y$

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

$4p(-2--6) = (0-2)^2$

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

$(y+6) = (x-2)^2$

22) Roads are often designed with parabolic surfaces to allow rain to drain off. A particular road that is 32 feet wide is 0.4 foot higher in the center than it is on the sides. Find an equation of the parabola that models the road surface. How far from the center of the road is the road surface 0.1 foot lower than in the middle?

equation

$-640(y-.4) = x^2$

$(0, .4)$

$(16, 0)$

$-640(.3-.4) = x^2$

$64 = x^2$

$x = 8$ ft

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

$4p(0-.4) = (16-0)^2$

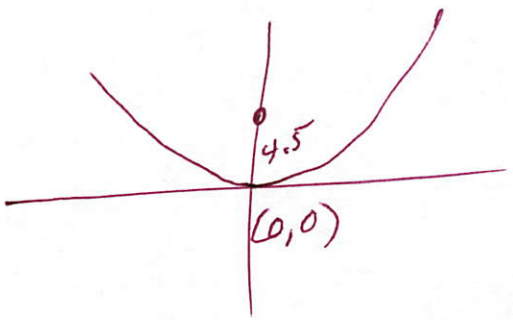
$-1.6p = 256$

$p = -160$

$(x, y) = (16, 0)$

$(h, k) = (0, .4)$

23) Satellite Antenna: The receiver in a parabolic television dish antenna is 4.5 feet from the vertex and is located at the focus. Write an equation for a cross section of the reflector. Assume that the dish is directed upward and the vertex is at the origin.



$4py = x^2$

$18y = x^2$