Integrated Math 3
Unit 1: Analytic Geometry
1.16

Name: _____

Date:_____ Period:_____

Objective: Writing and graphing equations of parabolas

Warm Up: Given the circle equation: $x^2 + y^2 + 4x - 6y + 9 = 0$

$x^2 + 4x + \underline{4} + y^2 - 6y + \underline{9} = -9 + \underline{4} + \underline{9}$

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

A.) Determine the center

$(-2, 3)$

B.) Determine the radius

$r = 2$ units

C.) Determine the area

$A = \pi r^2 = \pi(2)^2$

$= 4\pi$ units^2

D.) Determine the circumference

$C = 2\pi r = 2\pi(2)$

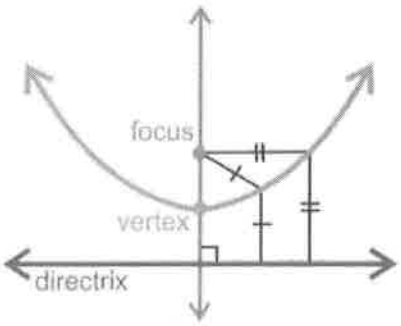
$= 4\pi$ units

Key Terms:

Parabola: a relation that has the property that any point on it is equidistant from a point called the **focus** and a line called the **directrix.**

Vertex: a point that lies halfway between the focus and directrix

Focus: a point that lies on the axis of symmetry (every point lying on parabola is equidistant to the focus)



Directrix: a line that is perpendicular to the axis of symmetry

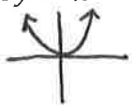
Axis of Symmetry: a line that cuts the parabola in half

Parabolas have an awesome property such that the distance from the vertex to the focus & the distance from the vertex to the directrix is the same. We call this distance p.

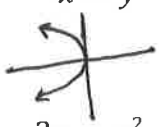
When a parabola opens up or down	When a parabola opens right or left
$(x-h)^2 = 4p(y-k) \Rightarrow x^2$	$(y-k)^2 = 4p(x-h) \Rightarrow y^2$
• If p is positive, it opens up	• If p is positive, it opens to the right
• If p is negative, it opens down	• If p is negative, it opens to the left

Example 1: Determine the direction the parabola opens & draw a brief sketch.

A.) $8y = x^2$ $x^2 \Rightarrow$ up/down, $+8 \Rightarrow$ up

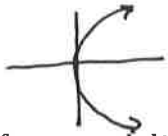


B.) $-x = y^2$ $y^2 \Rightarrow$ left/right, $-1 \Rightarrow$ left



C.) $-4y = x^2$ $x^2 \Rightarrow$ up/down, $-4 \Rightarrow$ down

D.) $2x = y^2$ $y^2 \Rightarrow$ left/right, $+2 \Rightarrow$ right



Example 2: Graph each parabola and list the vertex, p-value, focus, and directrix.

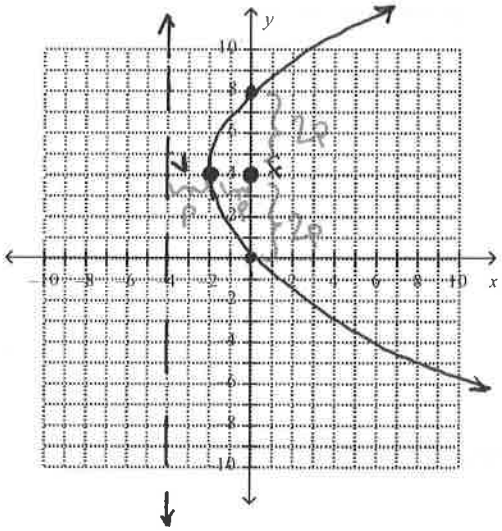
A.) $(y-4)^2 = 8(x+2)$ $y^2, +8 \Rightarrow$ opens right

Vertex: $(-2, 4)$

p-value: $\frac{8}{4} = 2$

Focus: $(0, 4)$

Directrix: $x = -4$



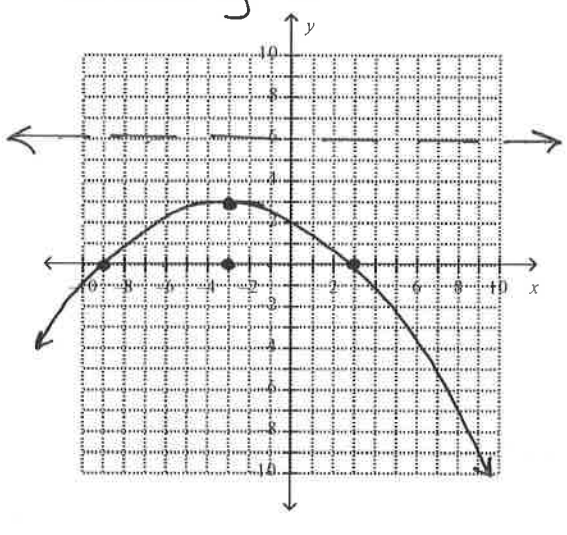
B.) $(x+3)^2 = -12(y-3)$ $x^2, -12 \Rightarrow$ opens down

Vertex: $(-3, 3)$

p-value: $\frac{-12}{4} = -3$

Focus: $(-3, 0)$

Directrix: $y = 6$



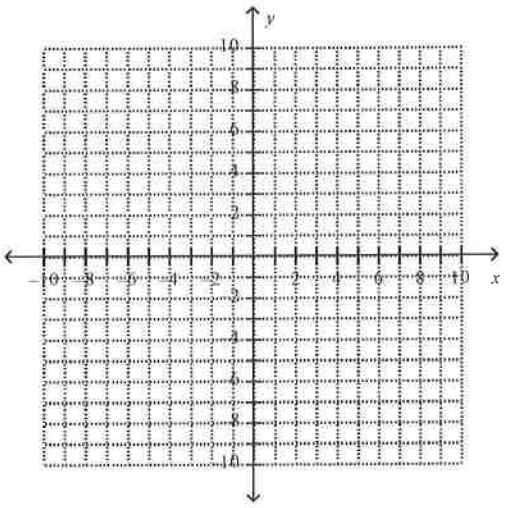
C.) $(y+3)^2 = -16\,(x-5)$

Vertex:

p-value:

Focus:

Directrix:



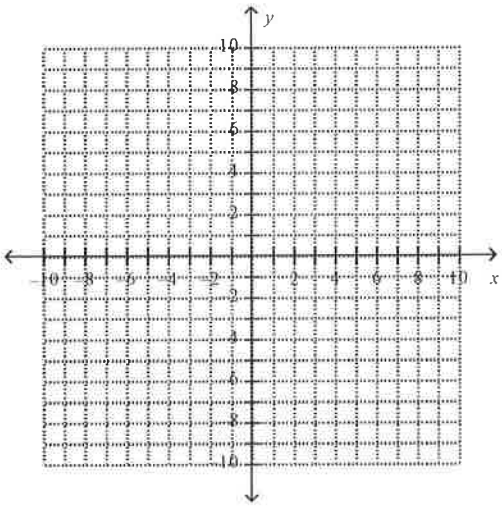
D.) $(x-6)^2 = 6y$

Vertex:

p-value:

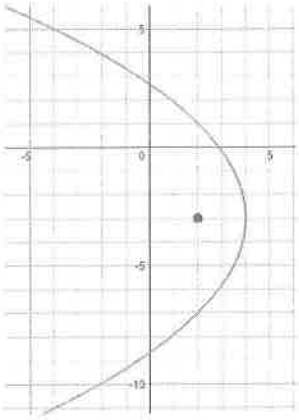
Focus:

Directrix:



Example 3: Analyze the following graphs in order in order to provide the missing information.

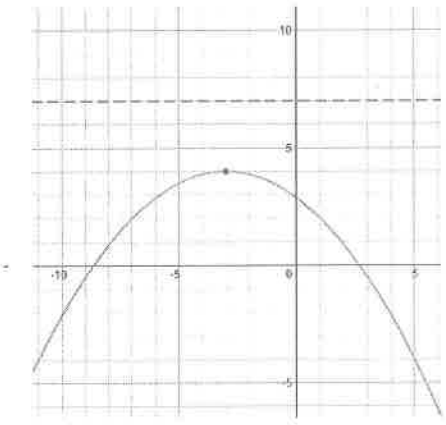
a.)



Directrix:

Equation:

b.)



Focus:

Equation: