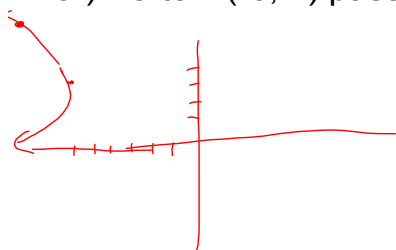**9.1 Parabola Extension**

1.) Write the equation of the parabola with the given information.

a.) Vertex: (-6, 4) passing through (-10, 8); opens horizontally

$$(y-4)^2 = 4p(x+6)$$
$$4^2 = 4p \cdot -4$$
$$16 = -16p$$
$$p = -1$$

$$\boxed{(y-4)^2 = -4(x+6)}$$

b.) Vertex: (1, 8) passing through (11, 13); opens vertically
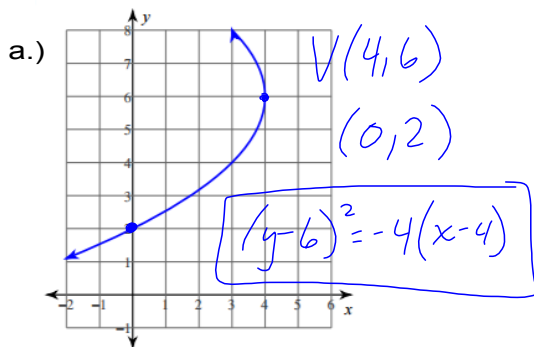
$$(x-1)^2 = 4p(y-8) \longrightarrow (x-1)^2 = 20(y-8)$$
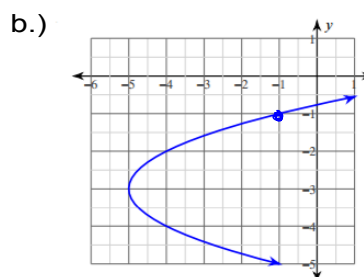$$100 = 4p(5)$$
$$p = 5$$

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2.) Write the equation of the parabola with the given information.

a.)

$$V(4,6)$$
$$(0,2)$$
$$\boxed{(y-6)^2 = -4(x-4)}$$

$$(y-6)^2 = 4p(x-4)$$
$$16 = 4p(-4)$$
$$p = -1$$

b.)

$$V(-5,-3) \quad (-1,-1)$$
$$(y+3)^2 = 4p(x+5)$$
$$4 = 16p \quad \boxed{(y+3)^2 = (x+5)}$$
$$p = 1/4$$

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1

9.1 Circle and Parabola Applications

3.) Many railroad viaducts are constructed in the shape of a semicircle. A stone-arch railroad viaduct at Rockville, Pennsylvania, over the Susquehanna River is made of 48 semicircular arches, each with a span of 70 feet. Use Figure 12.1 to write equations that model each of the first two arches.

Figure 12.1

$C(45,0)$ $C(125,0)$

$r = 35$ $r = 35$
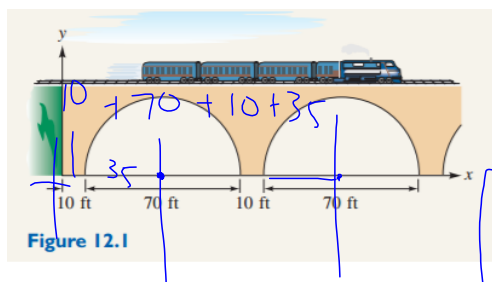
$(x-45)^2 + y^2 = 1225$ $(x-125)^2 + y^2 = 1225$

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4.) A wall clock is circular with a ring containing the numerals. The inner border of the ring is described by the equation
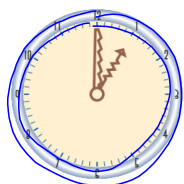
$$x^2 + y^2 = 22.5625$$

and the outer border of the ring is described by the equation

$$x^2 + y^2 = 30.25$$

with distances measured in inches. Find the radius of each of the concentric circles. Determine the circumference of each circle. What is the difference in the circumferences of the two circles?
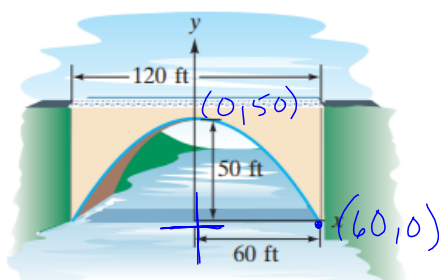
Inner

$r = 4.75$ in

$C = 2\pi(4.75)$ in

$= 9.5\pi$ in

Outer

$r = 5.5$ in

$C = 2 \cdot 5.5\pi$ in

$= 11\pi$ in

Difference : 1.5π in

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5.) A concrete bridge is designed with an arch in the shape of a parabola. The road over the bridge is 120 feet long and the maximum height of the arch is 50 feet. Write an equation for the parabolic arch.
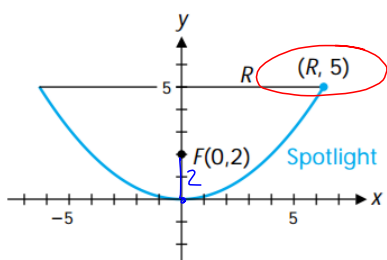
$V(0, 50)$ $x^2 = 4p(y-50)$

$(60, 0)$ $3600 = -200p$

$-18 = p$

$$x^2 = -72(y-50)$$

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6.) A paraboloid is formed by revolving a parabola about its axis. A spotlight in the form of a paraboloid 5 inches deep has its focus 2 inches from the vertex. Find, to one decimal place, the radius R of the opening of the spotlight.
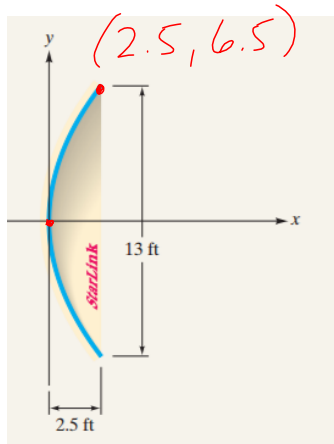
$x^2 = 4py$

$x^2 = 8y \leftarrow 5$

$\sqrt{x^2} = \sqrt{40}$

$x = 6.3 in$

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7.) A satellite dish receiver is in the shape of a parabola. A cross section of the dish shows a diameter of 13 feet at a distance of 2.5 feet from the vertex of the parabola. Write an equation for the parabola.

$(2.5, 6.5)$

$y^2 = 4px$

$(6.5)^2 = 4p(2.5)$

$42.25 = 10p$

$4.225 = p$

$y^2 = 16.9x$

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