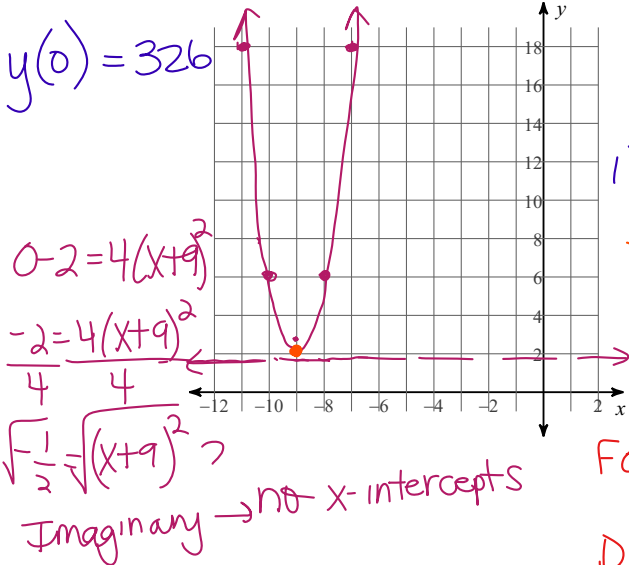


Parabolas and Circles Notes

Use the information provided to write the vertex form equation of each parabola. Identify the vertex, focus, directrix, y-intercept, and x-intercepts of each. Then sketch the graph.

1)  $y = 4x^2 + 72x + 326$

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



1)  $y - 326 = 4(x^2 + 18x + 81)$   
 $+324$

$y - 2 = 4(x + 9)^2$  or  $y = 4(x + 9)^2 + 2$

$V(-9, 2)$

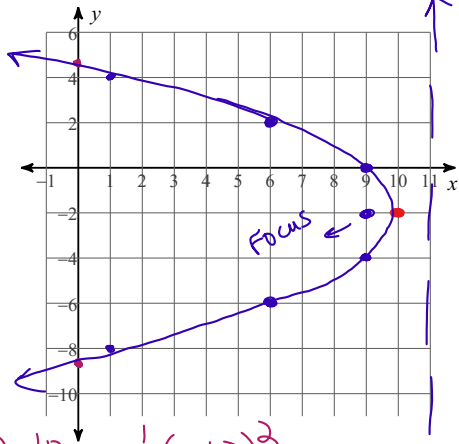
Focal length =  $p$

$p = \frac{1}{4a} = \frac{1}{4(4)} = \frac{1}{16}$

Focus  $(-9, 2\frac{1}{16})$

Directrix  $y = 1\frac{15}{16}$

$$2) x = -\frac{1}{4}y^2 - y + 9$$



$$x - 9 = -\frac{1}{4}(y^2 + 4y + 4)$$

$$x - 10 = -\frac{1}{4}(y + 2)^2$$

$$x(0) = 9$$

$$V(10, -2)$$

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

$$\text{focus } (9, -2) \quad \text{directrix } x = 11$$

$$0 - 10 = -\frac{1}{4}(y + 2)^2$$

$$-4 \left[ -10 = -\frac{1}{4}(y + 2)^2 \right] - 4$$

$$\sqrt{40} = \sqrt{(y + 2)^2}$$

$$\pm 2\sqrt{10} = y + 2$$

$$-2 \pm 2\sqrt{10} = y$$

directrix

$$\frac{-5}{2} - \frac{-4}{1} = \frac{-20}{2} = 10$$

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

$$3) y = -\frac{1}{4}x^2 - \frac{5}{2}x - \frac{61}{4}$$

$$y + \frac{61}{4} = -\frac{1}{4}(x^2 + 10x + 25)$$

$$\frac{-25}{4}$$

$$y + 9 = -\frac{1}{4}(x + 5)^2$$

$$4) x = 2y^2 + 32y + 133$$

$$x - 133 = 2(y^2 + 16y + 64) + 128$$

$$x - 5 = 2(y + 8)^2$$

Use the information provided to write the vertex form equation of each parabola. Identify the vertex, focus, directrix, y-intercept, and x-intercepts of each.

$$5) y = \frac{1}{3}x^2 - 3x + \frac{14}{3}$$

$$y - \frac{14}{3} = \frac{1}{3}x^2 - 3x + \frac{27}{4}$$

$$+ \frac{27}{4} = \frac{1}{3}(x^2 - 9x + \frac{81}{4})$$

$$y + \frac{25}{12} = \frac{1}{3}(x - \frac{9}{2})^2$$

$$p = \frac{1}{4(\frac{1}{3})} = \frac{1}{4/3} = \frac{3}{4}$$

Focus.  $(\frac{9}{2}, \frac{-25}{12} + \frac{3}{4})$   $(\frac{9}{2}, -\frac{4}{3})$

$(\frac{9}{2}, \frac{-25+9}{12}) \rightarrow (\frac{9}{2}, -\frac{16}{12})$

Directrix  $y = -\frac{25}{12} - \frac{3}{4} \rightarrow -\frac{25}{12} - \frac{9}{12} = \frac{-34}{12} = y$  or  $(y = -\frac{17}{6})$

$$y(0) = \frac{14}{3}$$

$$0 + \frac{25}{12} = \frac{1}{3}(x - \frac{9}{2})^2$$

$$\sqrt{\frac{25}{4}} = \sqrt{(x - \frac{9}{2})^2}$$

$$\pm \frac{5}{2} = x - \frac{9}{2} \quad x\text{-int } (7, 0)$$

$$(2, 0)$$

$$x = \frac{9}{2} \pm \frac{5}{2} = 7, 2$$

$$6) x = -2y^2 + 22y - 60$$

$$x + 60 = -2(y^2 - 11y + \frac{121}{4})$$

$$x - \frac{1}{2} = -2(y - \frac{11}{2})^2$$

$$V (\frac{11}{2}, \frac{11}{2}) \quad p = \frac{1}{4(-2)} = -\frac{1}{8}$$

$$F (\frac{11}{2} - \frac{1}{8}, \frac{11}{2}) \rightarrow (\frac{33}{8}, \frac{11}{2})$$

$$\text{Directrix } x = \frac{11}{2} + \frac{1}{8} = \frac{5}{8} = x$$

$$x(0) = -60 \quad y\text{-int } (6, 0)$$

$$(5, 0)$$

$$(0 - \frac{1}{2} = -2(y - \frac{11}{2})^2) \quad \frac{-1}{2}$$

$$\sqrt{\frac{1}{4}} = \sqrt{(y - \frac{11}{2})^2}$$

$$\pm \frac{1}{2} = y - \frac{11}{2}$$

$$y = \frac{11}{2} \pm \frac{1}{2}$$

Use the information provided to write the standard form equation of each circle.

7) Three points on the circle:

$(-13, -10)$ ,  $(-3, -10)$ , and  $(-15, 2)$   
same  $y$

$$(-13-h)^2 = (-3-h)^2$$

$$169 + 26h + h^2 = 9 + 6h + h^2$$

$$\begin{array}{r} 169 + 26h = 9 + 6h \\ -169 \quad -6h \quad \downarrow \quad -169 \quad -6h \\ \hline 20h = -160 \end{array}$$

$$\frac{20h}{20} = \frac{-160}{20}$$

$$h = -8$$

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

$$(-13-h)^2 + (-10-k)^2 = r^2$$

$$(-3-h)^2 + (-10-k)^2 = r^2$$

$$(-15-h)^2 + (2-k)^2 = r^2$$

$$(-13 - (-8))^2 + (-10 - (-3))^2 = r^2$$

$$25 + 49 = r^2$$

$$74 = r^2$$

$$(-3 - (-8))^2 + (-10 - k)^2 = (-15 - (-8))^2 + (2 - k)^2$$

$$25 + 100 + 20k + k^2 = 49 + 4 - 4k + k^2$$

$$\begin{array}{r} 125 + 20k = 53 - 4k \\ -125 \quad +4k \quad \downarrow \quad -125 \quad +4k \\ \hline 24k = -72 \end{array}$$

$$\frac{24k}{24} = \frac{-72}{24} \rightarrow k = -3$$

$$(x+8)^2 + (y+3)^2 = 74$$

$$\frac{-11 + (-9)}{2} = -10$$

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

8) Vertex:  $(-3, 2)$ , Directrix:  $y = \frac{47}{24}$

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

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

$\checkmark$   $y$ -value  
 $\frac{48}{24} - 7 = \frac{47}{24}$   
 $\frac{1}{4a} = \frac{1}{24}$   
 $a = 6$

9) Focus:  $(-11, -4)$ , Directrix:  $x = -9$

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

$$x + 10 = a(y + 4)^2$$

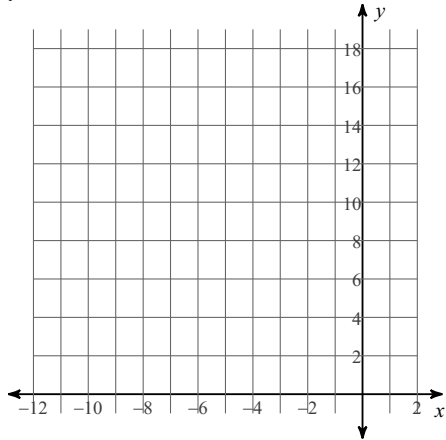
$$p = 1 = \frac{1}{4a} \rightarrow a = -\frac{1}{4}$$

$$x + 10 = -\frac{1}{4}(y + 4)^2$$

# Parabolas and Circles Notes

Use the information provided to write the vertex form equation of each parabola. Identify the vertex, focus, directrix, y-intercept, and x-intercepts of each. Then sketch the graph.

1)  $y = 4x^2 + 72x + 326$



$$y - 2 = 4(x + 9)^2$$

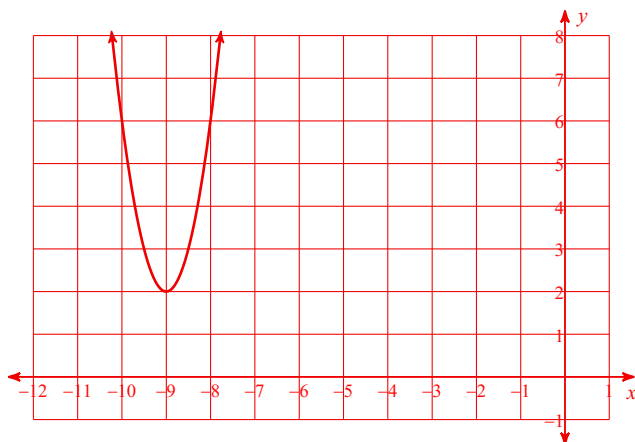
Vertex:  $(-9, 2)$

No x-intercepts

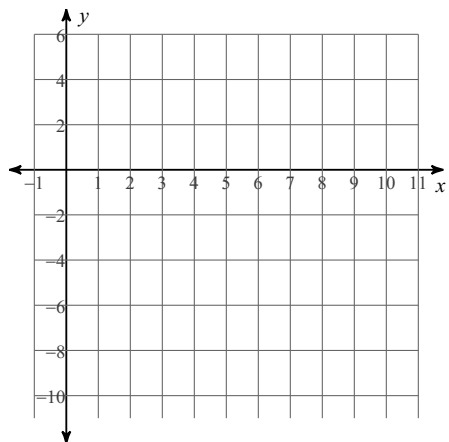
y-intercept  $(0, 326)$

Focus:  $(-9, 33/16)$

Directrix  $y = \frac{31}{16}$



$$2) x = -\frac{1}{4}y^2 - y + 9$$



$$x - 10 = -\frac{1}{4}(y + 2)^2$$

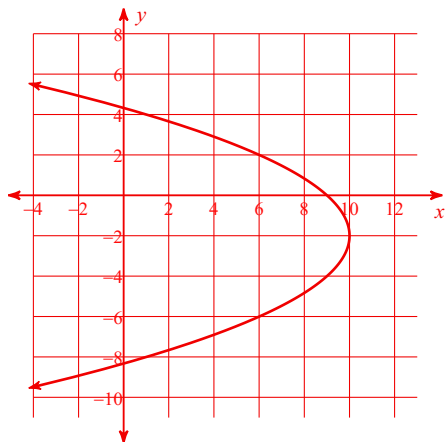
Vertex: (10, -2)

x-intercept: (9, 0)

y-intercept (0,  $-2 \pm 2\sqrt{10}$ )

Focus: (9, -2)

Directrix  $x = 11$



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

$$3) y = -\frac{1}{4}x^2 - \frac{5}{2}x - \frac{61}{4}$$

$$y = -\frac{1}{4}(x + 5)^2 - 9$$

$$4) x = 2y^2 + 32y + 133$$

$$x = 2(y + 8)^2 + 5$$



Use the information provided to write the vertex form equation of each parabola. Identify the vertex, focus, directrix, y-intercept, and x-intercepts of each.

5)  $y = \frac{1}{3}x^2 - 3x + \frac{14}{3}$

$$y + \frac{25}{12} = \frac{1}{3}\left(x - \frac{9}{2}\right)^2$$

$$\text{Vertex: } \left(\frac{9}{2}, -\frac{25}{12}\right)$$

$$\text{Focus: } \left(\frac{9}{2}, -\frac{4}{3}\right)$$

$$\text{Directrix: } y = -\frac{17}{6}$$

$$\text{y-intercept: } \left(0, \frac{14}{3}\right)$$

$$\text{x-intercept: } (7, 0) \text{ and } (2, 0)$$

6)  $x = -2y^2 + 22y - 60$   $x - \frac{1}{2} = -2\left(y - \frac{11}{2}\right)^2$

$$\text{Vertex: } \left(\frac{1}{2}, \frac{11}{2}\right)$$

$$\text{Focus: } \left(\frac{3}{8}, \frac{11}{2}\right)$$

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

$$\text{y-intercept: } (0, 5) \text{ and } (0, 6)$$

$$\text{x-intercept: } (-60, 0)$$

**Use the information provided to write the standard form equation of each circle.**

7) Three points on the circle:

$(-13, -10)$ ,  $(-3, -10)$ , and  $(-15, 2)$

$$(x + 8)^2 + (y + 3)^2 = 74$$

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

8) Vertex:  $(-3, 2)$ , Directrix:  $y = \frac{47}{24}$

$$y = 6(x + 3)^2 + 2$$

9) Focus:  $(-11, -4)$ , Directrix:  $x = -9$

$$x = -\frac{1}{4}(y + 4)^2 - 10$$