

Mat 1275 HW 16

16.4 Exercises

1. Graph $y - 1 = (x + 3)^2$ and $(x + 3)^2 + (y - 1)^2 = 16$.

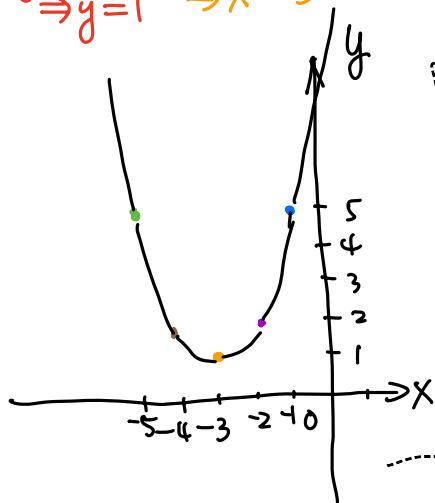
Parabola

It has $x^2 \Rightarrow$ open up

Vertex: $(-3, 1)$

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

$$\begin{aligned} y - 1 = 0 & \Rightarrow y = 1 \\ x + 3 = 0 & \Rightarrow x = -3 \end{aligned}$$



| x | y |
|----|---|
| -1 | 5 |
| -2 | 2 |
| -3 | 1 |
| -4 | 2 |
| -5 | 5 |

$$(y - 1 = (-1 + 3)^2 \Rightarrow y - 1 = 2^2 \Rightarrow y = 5)$$

$$(y - 1 = (-2 + 3)^2 \Rightarrow y - 1 = 1^2 \Rightarrow y = 2)$$

$$(y - 1 = (-3 + 3)^2 \Rightarrow y - 1 = 0 \Rightarrow y = 1)$$

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

$$(y - 1 = (-5 + 3)^2 \Rightarrow y - 1 = (-2)^2 \Rightarrow y = 5)$$

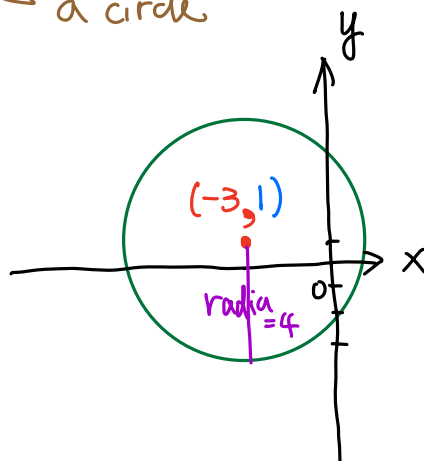
$$(x + 3)^2 + (y - 1)^2 = 16$$

\Rightarrow a circle

Center $(-3, 1)$

$$\begin{aligned} x + 3 = 0 & \Rightarrow x = -3 \\ y - 1 = 0 & \Rightarrow y = 1 \end{aligned}$$

$$\text{radius} = \sqrt{16} = 4$$



2. Graph $x - 1 = (y^3)^2$.

| x | y |
|----|----|
| 2 | -1 |
| 65 | -2 |
| 1 | 0 |
| 2 | 1 |
| 65 | 2 |

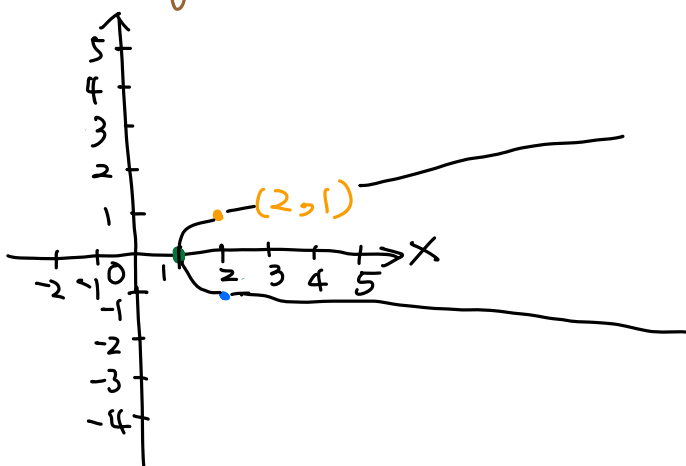
$$y = -1 \Rightarrow x - 1 = ((-1)^3)^2 \Rightarrow x - 1 = (-1)^2 = 1 \Rightarrow x = 2$$

$$y = -2 \Rightarrow x - 1 = ((-2)^3)^2 \Rightarrow x - 1 = (-8)^2 = 64 \Rightarrow x = 65$$

$$y = 0 \Rightarrow x - 1 = (0^3)^2 \Rightarrow x - 1 = 0 \Rightarrow x = 1$$

$$y = 1 \Rightarrow x - 1 = (1^3)^2 \Rightarrow x - 1 = 1 \Rightarrow x = 2$$

$$y = 2 \Rightarrow x - 1 = (2^3)^2 \Rightarrow x - 1 = 64 \Rightarrow x = 65$$

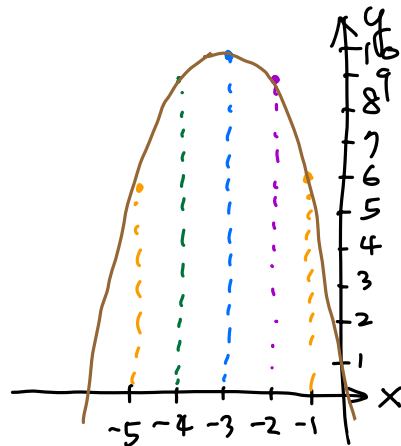


3. Graph $y + x^2 + 6x - 1 = 0$.

$$\begin{aligned} y + x^2 + 6x + 9 - 1 &= 0 + 9 \\ y + (x+3)^2 - 1 &= 9 \\ -(x+3)^2 - 9 &= -9 - (x+3)^2 \end{aligned}$$

$$\Rightarrow y - 10 = - (x+3)^2$$

| x | y |
|----|----|
| -1 | 6 |
| -2 | 9 |
| -3 | 10 |
| -4 | 9 |
| -5 | 6 |



It has $-x^2$: parabola and it opens downward

Vertex: $(-3, 10)$

$$y - 10 = 0 \Rightarrow y = 10$$

$$x + 3 = 0 \Rightarrow x = -3$$

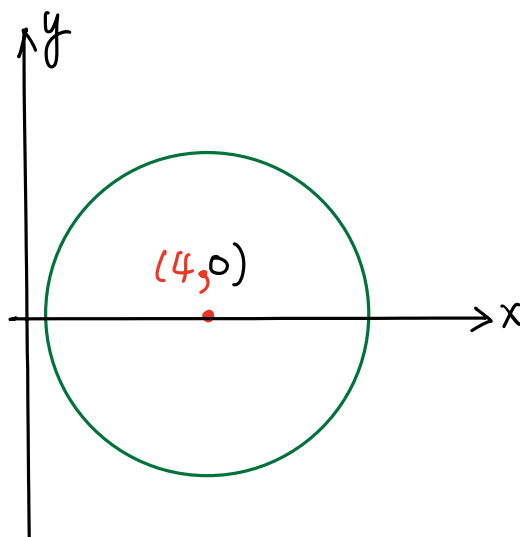
4. Graph $x^2 + y^2 - 8x + 4 = 0$.

$$\Rightarrow x^2 - 8x + 16 + y^2 + 4 = 0 + 16$$

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

$$\Rightarrow (x-4)^2 + y^2 = 12$$

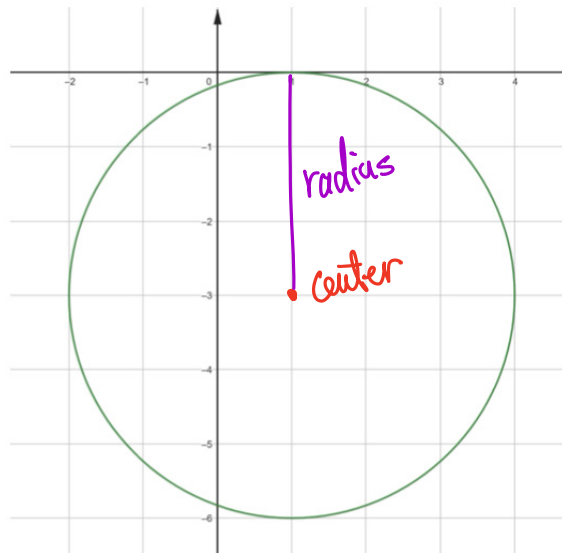
$$\begin{aligned} x-4 &= 0 \Rightarrow x=4 \\ y &= 0 \end{aligned}$$



Center $(4, 0)$

$$\text{radius} = \sqrt{12} = 2\sqrt{3}$$

5. Find an equation whose graph is



radius = 3

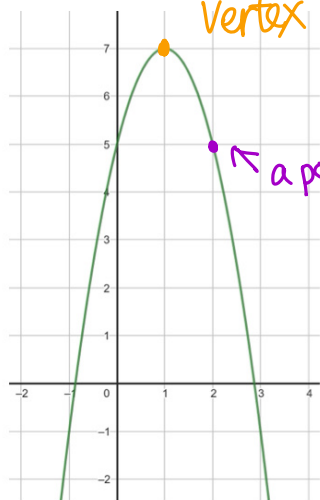
Center: $(-1, -3)$

\Rightarrow circle's equation

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

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

6. Find an equation whose graph is



Vertex $(1, 7)$

the parabola is open downward

$$y - 7 = -C \cdot (x - 1)^2$$

a point $(2, 5)$

$$5 - 7 = -C \cdot (2 - 1)^2$$

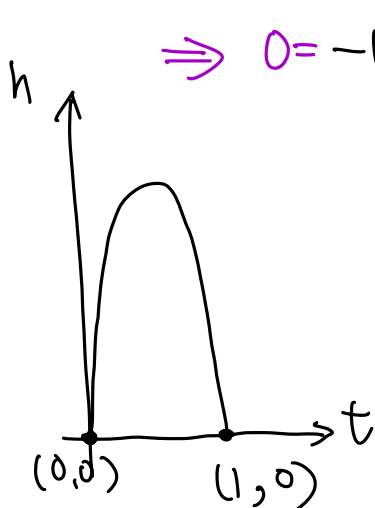
$$\Rightarrow -2 = -C \cdot (1)^2 \Rightarrow C = 2$$

$$\Rightarrow \boxed{y - 7 = -2(x - 1)^2}$$

7. Suppose the height h in feet of an object at time t seconds is given by $h = -16t^2 + 16t$. How high is the object at 0 second? Use the equation to find the x -intercepts and sketch the graph. How high is the object after $1/4$ seconds? At what other time is this the height of the object?

$t = 0$, ask for h ? $h = -16(0)^2 + 16 \cdot 0 = 0$ (in feet)

x -intercept (means find t when $h = 0$)



$$\Rightarrow 0 = -16t^2 + 16t \Rightarrow 0 = -16t(t - 1)$$

$$\Rightarrow \frac{-16t}{-16} = \frac{0}{-16} \text{ or } t - 1 = 0$$

$$\Rightarrow t = 0 \text{ or } t = 1$$

$$\Rightarrow x\text{-intercepts are } (0, 0) \text{ and } (1, 0)$$

height after $t = \frac{1}{4}$? $\Rightarrow h = -16\left(\frac{1}{4}\right)^2 + 16\left(\frac{1}{4}\right)$
 $= -16 \cdot \frac{1}{16} + 16 \cdot \frac{1}{4} = -1 + 4 = 3$ (in feet)

At what t that height is also 3?

$$3 = -16t^2 + 16t$$

$$\Rightarrow 16t^2 - 16t + 3 = 0$$

$$\Rightarrow (4t - 1)(4t - 3) = 0$$

$$\Rightarrow 4t - 1 = 0 \text{ or } 4t - 3 = 0$$

$$\Rightarrow t = \frac{1}{4} \text{ or } t = \frac{3}{4}$$

$$\Rightarrow t = \frac{3}{4}$$