

1.2 Graphs of Equations

Vocabulary:

1) Equation in two variables: $y = 7 - 3x$

a) Solution (of equation in two variables)

$$(1, 4) : 4 \stackrel{?}{=} 7 - 3 \cdot 1$$

Solution $4 = 4$

b) Graph

x	-2	-1	0	1	2	3
y	13	10	7	4	1	-2

$(-2, 13), (-1, 10), \dots$

c) x-intercept

$$y = 0$$

$$0 = 7 - 3x \quad \left(\frac{7}{3}, 0\right)$$

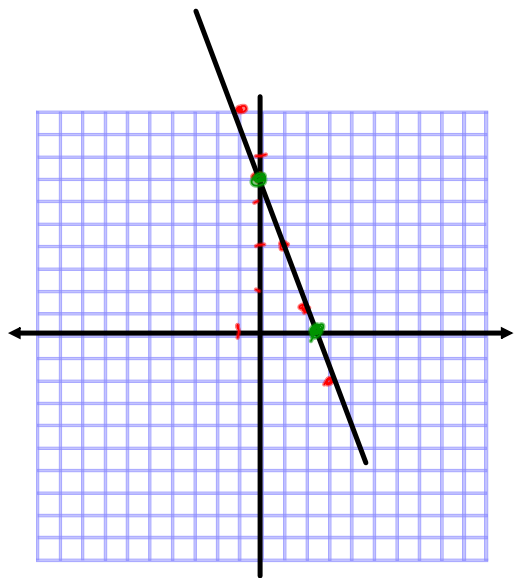
$$3x = 7$$

$$x = \frac{7}{3}$$

d) y-intercept

$$x = 0 \quad y = 7 - 3 \cdot 0 \quad (0, 7)$$

$$y = 7$$



Examples:

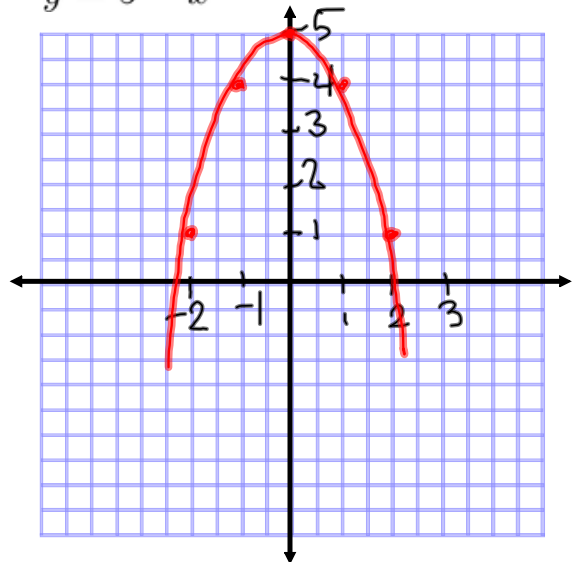
1) Does the point (1,5) lie on the graph of $y = 4 - |x - 2|$

$$\begin{aligned} 5 &\stackrel{?}{=} 4 - |1 - 2| \\ 5 &\stackrel{?}{=} 4 - |-1| \\ 5 &\stackrel{?}{=} 4 - 1 \\ 5 &\neq 3 \end{aligned}$$

(1,5) does not satisfy the equation. and does not lie on this graph.

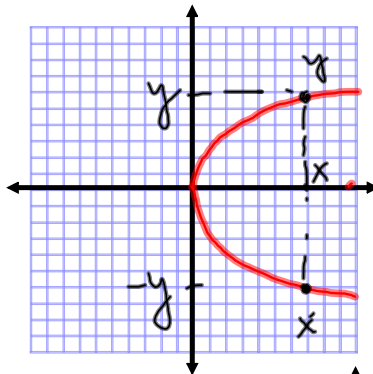
2) Complete the table of values and sketch the graph of $y = 5 - x^2$

x	y
-2	1
-1	4
0	5
1	4
2	1

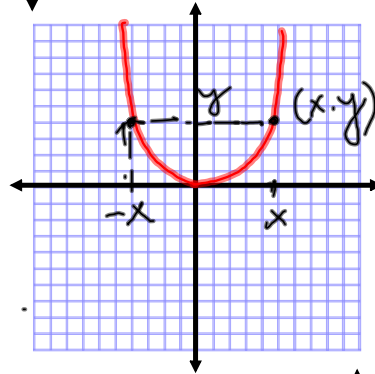


2) Symmetry:

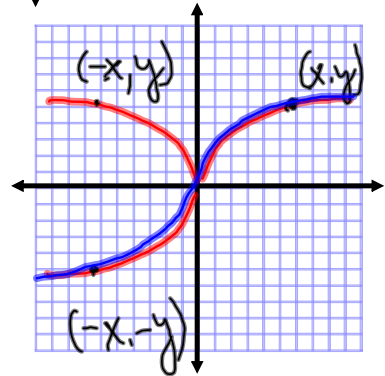
a) With respect to the x-axis
 (x, y) and $(x, -y)$
lie on the graph.



b) With respect to the y-axis
 (x, y) and $(-x, y)$
lie on the graph.



c) With respect to the origin
 (x, y) and $(-x, -y)$



3) Find the x-intercept and the y-intercept and use symmetry to sketch a graph of these equations.

$$y^2 = x + 1$$

x-intercept

$$y=0 \quad 0 = x+1$$

$$x = -1$$

$$(-1, 0)$$

y-intercept

$$x=0$$

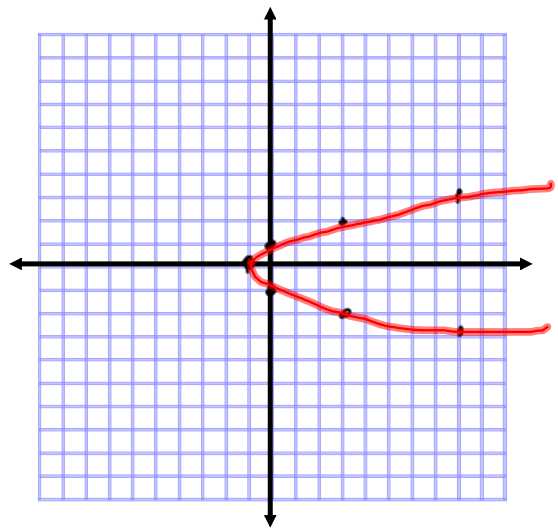
$$y^2 = 1$$

$$y = \pm 1$$

$(0, 1)$
 $(0, -1)$

symmetry:

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



x	3	8
y	2	3

4) Find the x-intercept and the y-intercept and use symmetry to sketch a graph of these equations.

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

x-int $y = 0$

$$0 = x^4 - x^2 + 3$$

$$0 = 1 \cdot (x^2)^2 - (x^2) + 3$$

$$x^2 = \frac{1 \pm \sqrt{1 - 4 \cdot 3}}{2} = \frac{1 \pm \sqrt{-11}}{2}$$

there is no x-int.

y-int $x = 0$

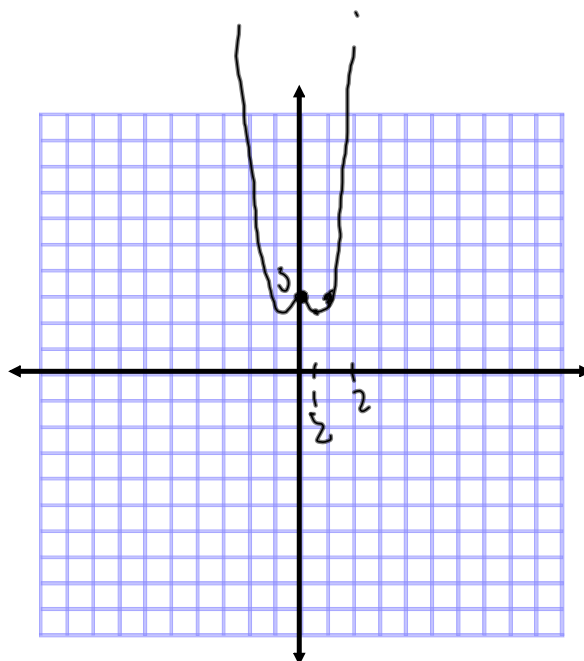
$$y = 0 - 0 + 3 = 3 \quad (0, 3)$$

symmetry

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

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

symmetric w respect to y axis



x	y
1	3
2	$16 - 4 + 3 = 15$
$\frac{1}{2}$	$\frac{1}{16} - \frac{1}{4} + 3$

4) Find the x-intercept and the y-intercept and use symmetry to sketch a graph of these equations.

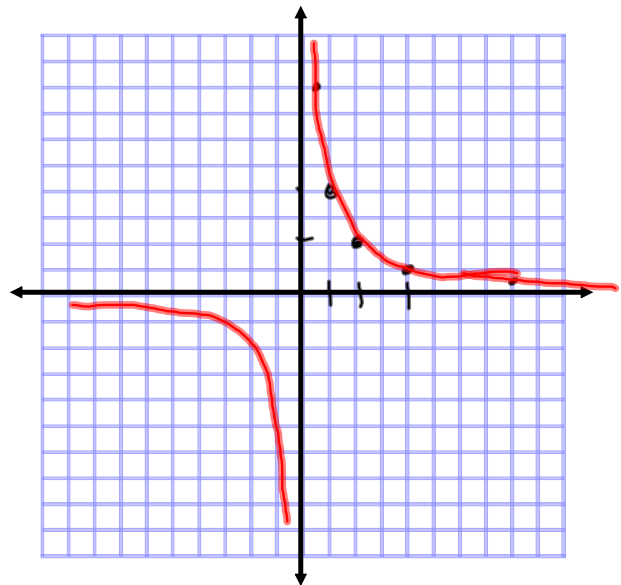
$$xy = 4$$

no intercepts

symmetry

$$(-x)(-y) = xy = 4$$

symmetry about
the origin

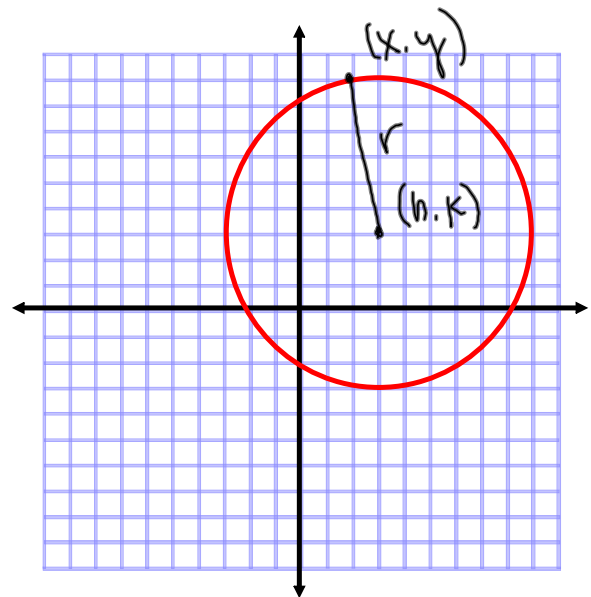


x	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8
y	16	8	4	2	1	$\frac{1}{2}$

CIRCLES

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

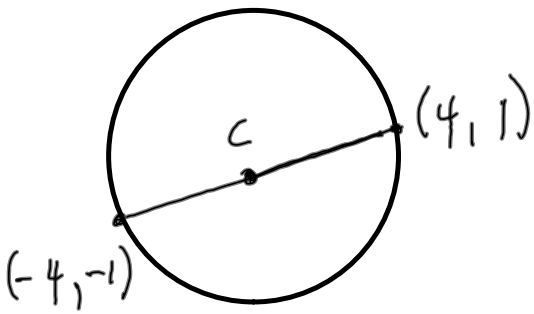
standard equation of the circle with center (h, k) and radius r



What is the standard equation of the circle with center at $(-3, 2)$ with radius 3:

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

5) Write the standard form of the equation of a circle with endpoints of the diameter at $(-4, -1)$ and $(4, 1)$



$$M \left(\frac{4 + (-4)}{2}, \frac{1 + (-1)}{2} \right) =$$
$$= \left(\frac{0}{2}, \frac{0}{2} \right) = (0, 0)$$

$$r = d = \sqrt{(4-0)^2 + (1-0)^2} =$$
$$= \sqrt{4^2 + 1^2} = \sqrt{17}$$

$$(x-0)^2 + (y-0)^2 = 17$$
$$x^2 + y^2 = 17$$