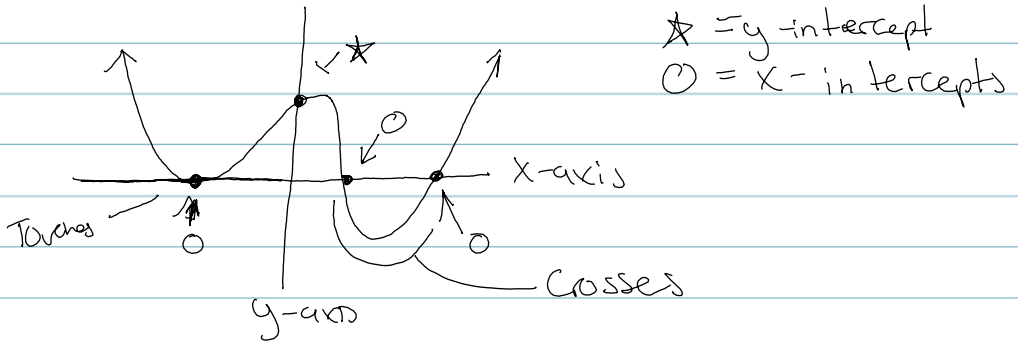
Section 2.2: Intercepts and Symmetry

- The points, if any, at which a graph crosses or touches the coordinate axes are called the intercepts.



- The x-intercepts are the points that touch or cross the x-axis. They always look like [some x value, 0]
  - (3, 0), (5, 0), (−7, 0)

- Y-intercepts are similar, but instead touch or cross the y-axis. They always look like [0, some y value)
  - (0, 1), (0, −15), (0, 3)

Ex 1 Find the intercepts, and use them to graph the equation.

- $4x - 2y = 8$

☆ To find x-values, set y to 0.

$(4x) - 2(0) = 8$

$4x - 0 = 8$

$\frac{4x}{4} = \frac{8}{4} \Rightarrow x = 2 \Rightarrow (2, 0)$

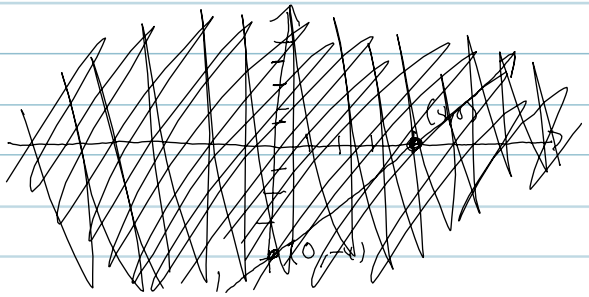
Sometimes we have bad days!

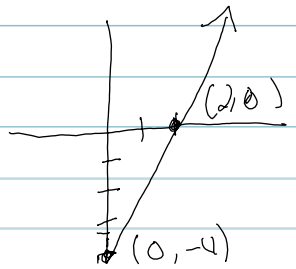
☆ To find y-values, set x to 0!

$4(0) - 2(y) = 8$

$0 - 2y = 8$

$\frac{-2y}{-2} = \frac{8}{-2} \Rightarrow y = -4 \Rightarrow (0, -4)$





Ex 2: Find the intercepts.

- $9x^2 + 4y = 36$

x-intercepts: $(-2, 0), (2, 0)$

$9x^2 + 4(0) = 36$

$9x^2 = 36$

$x^2 = 4$ — don't forget your 2 solutions!

$\sqrt{x^2} = \pm\sqrt{4}$

$\boxed{x = 2,\ x = -2}$

y-intercept: $(0, 9)$

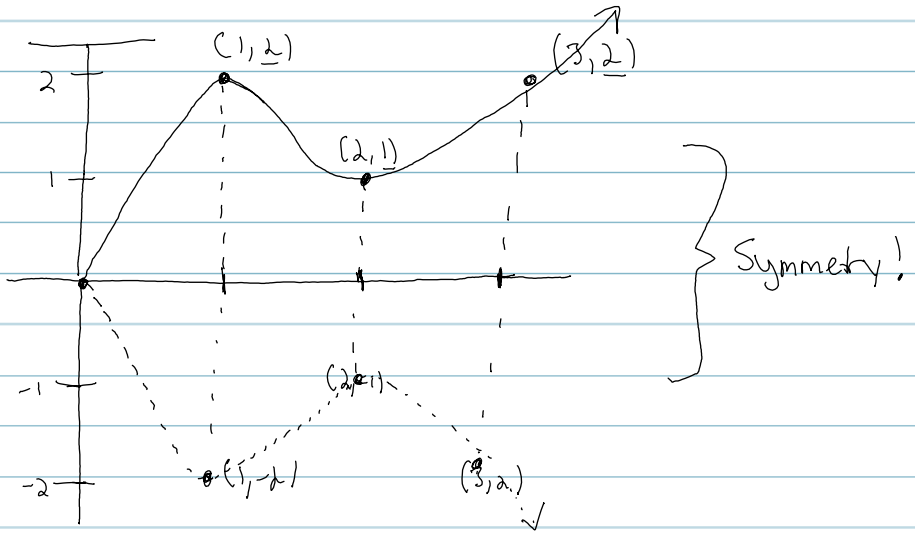
$9(0)^2 + 4y = 36$

$4y = 36$

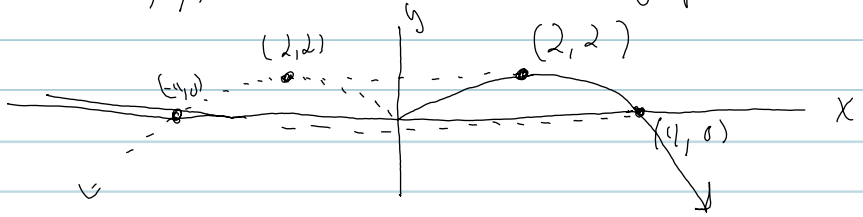
$\boxed{y = 9}$

Symmetry

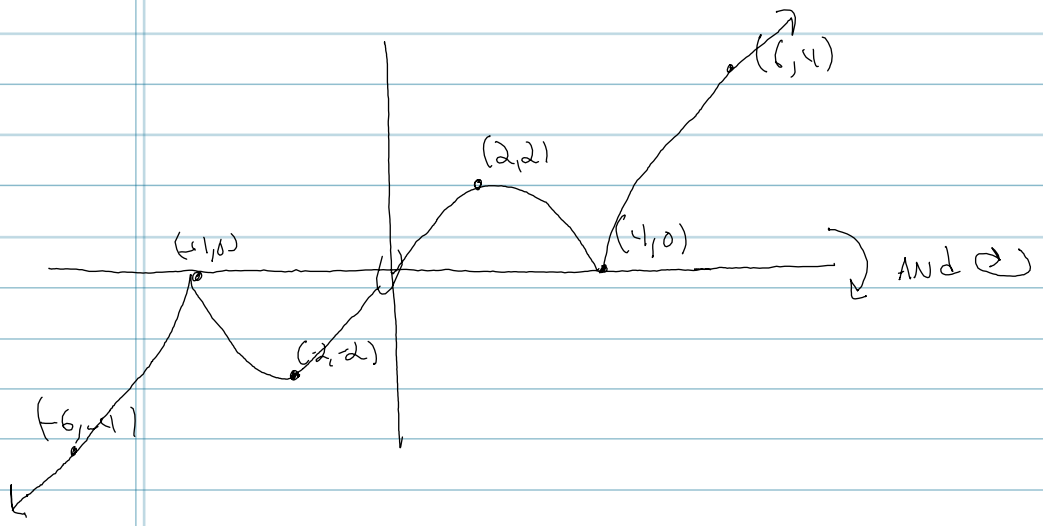
- A graph is said to be symmetric with respect to the x-axis if for every point (x, y) on the graph, the point $(x, -y)$ is also on the graph.



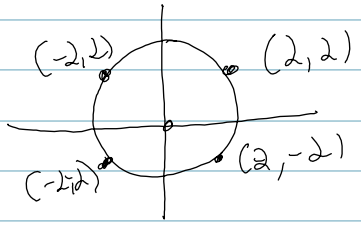
- A graph is said to be symmetric with respect to the y-axis if for every point (x, y) on the graph, the point $(-x, y)$ is also on the graph.



- A Graph is said to be symmetric with respect to the origin if for every point (x, y) on the graph, the point $(-x, -y)$ is also on the graph.



★ Note – A graph can be symmetrical with respect to more than one access, something like a circle, for example.



Ex 3: List the intercepts and determine the symmetry.

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

$0 = x + 4 \Rightarrow x = -4$

$y^2 = 0 + 4$

$y = \pm 2$.

★ Intercepts are $(-4, 0), (0, -2), (0, 2)$

(b) $y = \frac{3x}{x^2 + 9}$

$y = \frac{3(0)}{(0)^2 + 9} = \frac{0}{9} = 0 \Rightarrow (0, 0)$ is your y-intercept

$(0, 0)$ is your x-intercept.

$0 = \frac{3x}{x^2 + 9} \Rightarrow (0)(x^2 + 9) = \frac{3x}{x^2 + 9}(x^2 + 9)$

$0 = 3x \Rightarrow x = 0$

You can multiply anything you want by your denominator here.

It's normal to have one intercept be the same for both x and y.

- To determine Symmetry, plug in values

let: $x = 1$, $y = \frac{3(1)}{(1)^2+9} = \frac{3}{10}$ $\Big\}$ $(1, 3/10)$

$x = -1$, $y = \frac{3(-1)}{(-1)^2+9} = \frac{-3}{1+9} = \frac{-3}{10}$ $\Big\}$ $(-1, 3/10)$

If (x, y) and $(-x, -y)$, what is the symmetry?

It's about the [redacted] Origin.