2.3 Average Rate of Change, Axis of Symmetry & Asymptotes NOTES

Average Rate of Change: The change in y (dependent variable) over the change in x (independent variable). Also known as the **slope** between two points. You may use the slope formula or the table method to find average rate of change.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

1. Using the table below.

Days (x)	Amount of Bacteria f(x)
1	19
2	30
3	48
4	76
5	121
6	192

Find the average rate of change from day 2 to day 5.

$$\overline{x_1} \qquad \overline{x_2}$$

$$+3 \left\langle \begin{array}{c|c} 2 & 30 \\ 5 & 121 \end{array} \right\rangle +91$$

$$\boxed{\frac{91}{3}}$$

2.

Find the average rate of change from
x = -1 to x = 3.
$$\overline{x_1} \qquad \overline{x_2}$$

$$+4 \left\langle \begin{array}{c|c} -1 & 4 \\ 3 & 1 \end{array} \right\rangle -3$$

$$\boxed{\frac{-3}{4}}$$

3. Find the average rate of change of f(x) = 2x – 3 from x = 2 to x = 4.
$$\overline{x_1} \qquad \overline{x_2}$$

$$2(2) - 3 = 1$$
$$2(4) - 3 = 5$$

$$+2 \left\langle \begin{array}{c|c} 2 & 1 \\ 4 & 5 \end{array} \right\rangle +4$$

$$\frac{4}{2} = \boxed{2}$$

Axis of Symmetry: The Axis of Symmetry is the vertical line that cuts through the graph, so the left side mirrors the right side. We mainly talk about the axis of symmetry for quadratic functions and other even degree polynomial functions.

We always write the AXIS OF SYMMETRY as $\boxed{x = _____}$
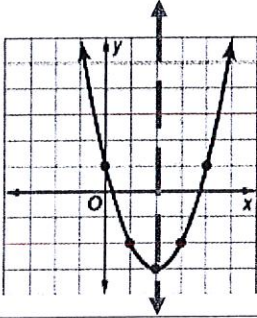
The axis of symmetry is x = 2 (drawn with a dashed line) because that is the line that cuts right through the middle of the graph (it goes through the vertex of a parabola.

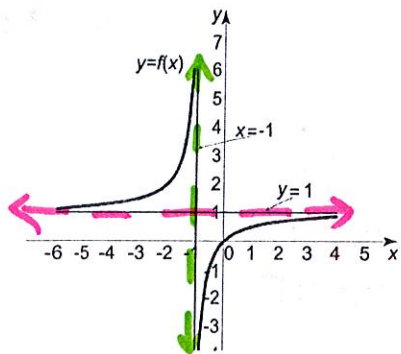**4. Axis of Symmetry:** $x = -3$

5. Axis of Symmetry: $x = 4$

6. Axis of Symmetry: $x = 3$

Asymptote: The asymptote is the horizontal or vertical line that a graph approaches or gravitates toward. Some functions can have *more than one* asymptote.

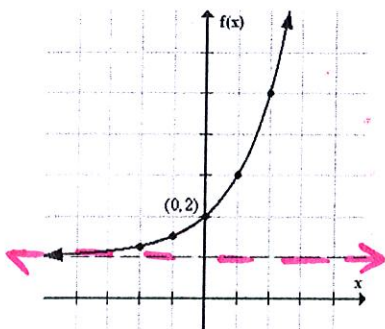We write <u>vertical asymptotes</u> as x = _____   We write <u>horizontal asymptotes</u> as y = _____

Examples are below:

The horizontal asymptote of the graph to the left is y = 1.

The vertical asymptote of the graph is x = -1.

We can see that the graph is "hugging" those lines and leveling off at those places.

Exponential functions only have one asymptote.

The horizontal asymptote of the graph to the left is y = 1.

7.

Vertical asymptote: **X = 0**

Horizontal asymptote: **Y = -1**

8.

Vertical asymptote: **NONE**

Horizontal asymptote: **y = 7**

9.

Vertical asymptote: **X = -2**

Horizontal asymptote: **NONE**