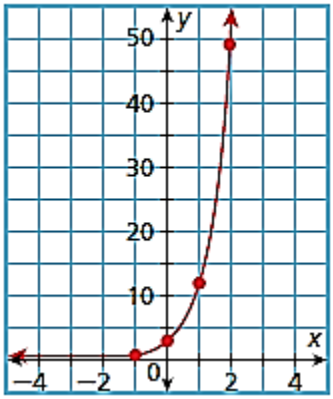
Characteristics of Exponential Functions

As you can hopefully recall, you learned about characteristics of functions in Unit 2 with linear functions and Unit 5 with quadratic functions. We are going to apply the same characteristics, but this time to exponential functions.

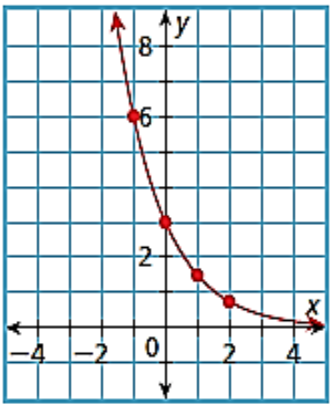
Domain and Range

Domain		
Define: All possible values of x	**Think:** How far left to right does the graph go?	**Write:** Smallest x ≤ x ≤ Biggest x *use < if the circles are open*
Range		
Define: All possible values of y	**Think:** How far down to how far up does the graph go?	**Write:** y < highest y value (opens down) y > lowest y value (opens up)



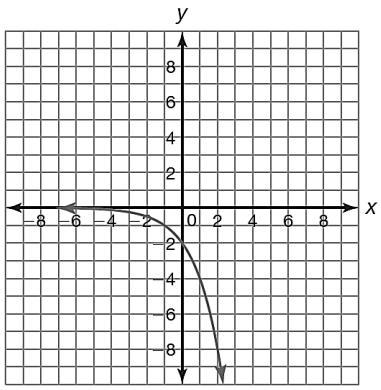
Domain:

Range:



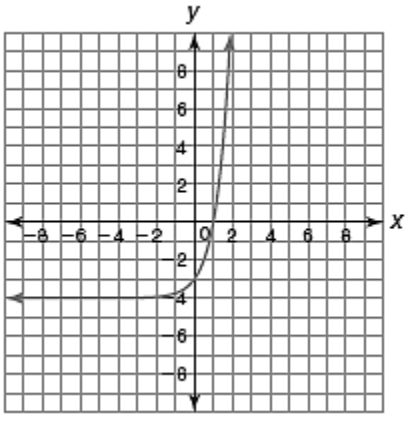
Domain:

Range:



Domain:

Range:

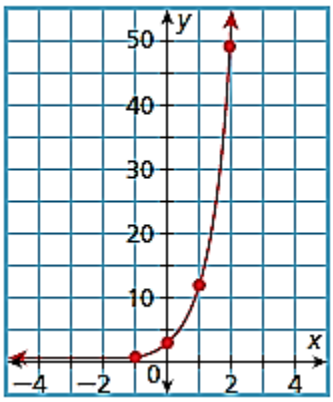


Domain:

Range:

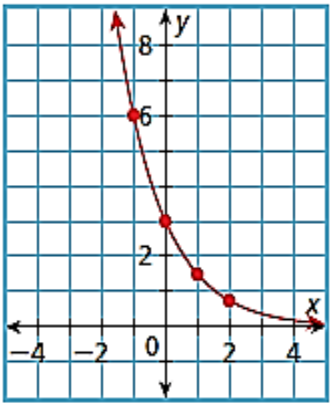
Intercepts and Zeros

Y-Intercept		
Define: Point where the graph crosses the y-axis	**Think:** At what coordinate point does the graph cross the y-axis?	**Write:** (0, b)
X-Intercept		
Define: Point where the graph crosses the x-axis	**Think:** At what coordinate point does the graph cross the x-axis?	**Write:** (a, 0)
Zero		
Define: Where the function (y-value) equals 0	**Think:** At what x-value does the graph cross the x-axis?	**Write:** x = ____



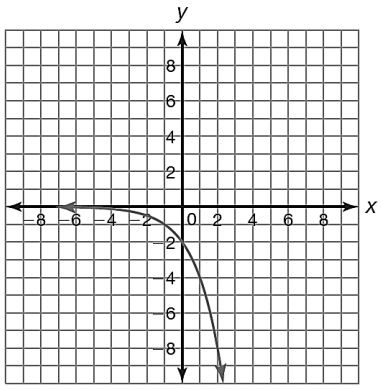
X-intercept: Zero:

Y-intercept:



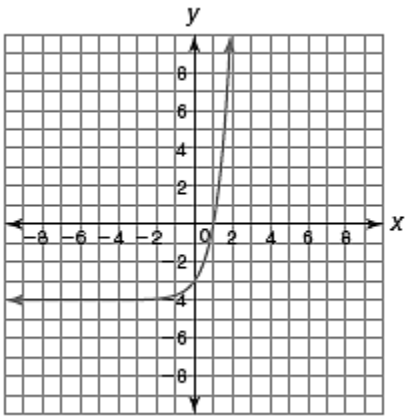
X-intercept: Zero:

Y-intercept:



X-intercept: Zero:

Y-intercept:

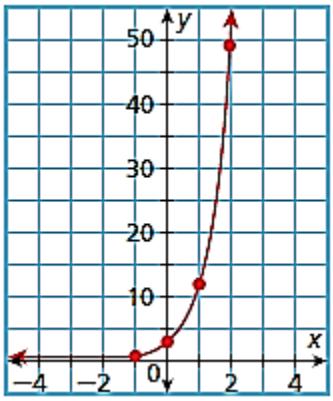


X-intercept: Zero:

Y-intercept:

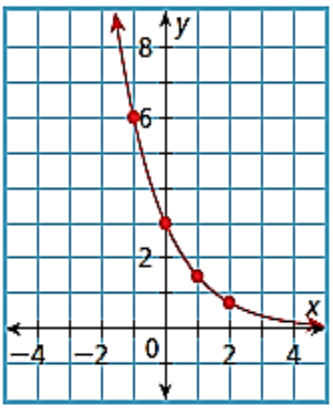
Extremas and Asymptotes

Maximum		
Define: Highest point of a function.	**Think:** What is my highest point on my graph?	**Write:** y =
Minimum		
Define: Lowest point of a function.	**Think:** What is the lowest point on my graph?	**Write:** y =
Asymptotes		
Define: A line that the graph get closer and closer to, but never touches or crosses.	**Think:** What values does my graph begin to flat line towards?	**Write:** y =



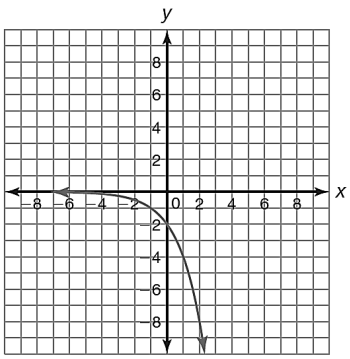
Maximum: Minimum:

Asymptote:



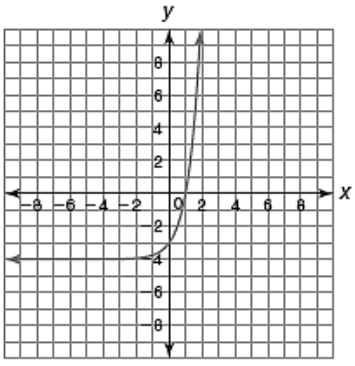
Maximum: Minimum:

Asymptote:



Maximum: Minimum:

Asymptote:

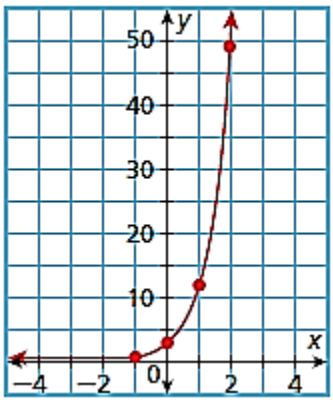


Maximum: Minimum:

Asymptote:

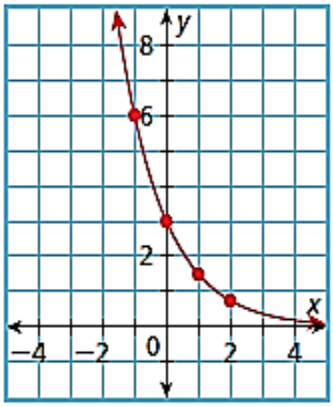
Intervals of Increase and Decrease

Interval of Increase		
Define: The part of the graph that is rising as you read left to right.	**Think:** From left to right, is my graph going up?	**Write:** An inequality using the x-value of the vertex
Interval of Decrease		
Define: The part of the graph that is falling as you read from left to right.	**Think:** From left to right, is my graph going down?	**Write:** An inequality using the x-value of the vertex



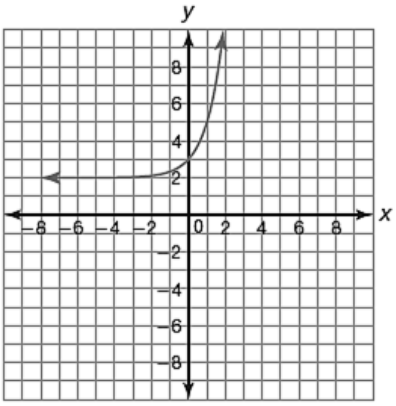
Interval of Increase:

Interval of Decrease:



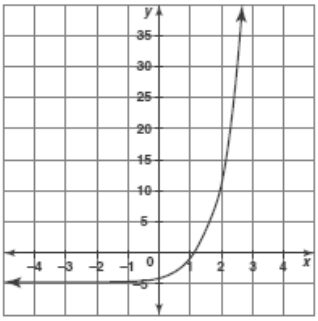
Interval of Increase:

Interval of Decrease:



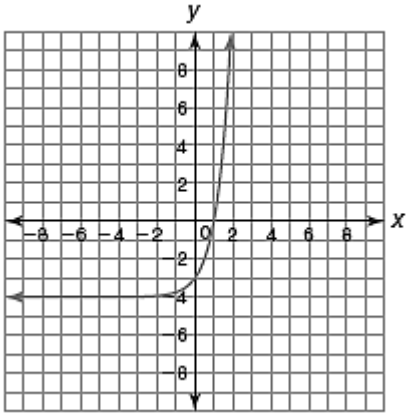
Interval of Increase:

Interval of Decrease:



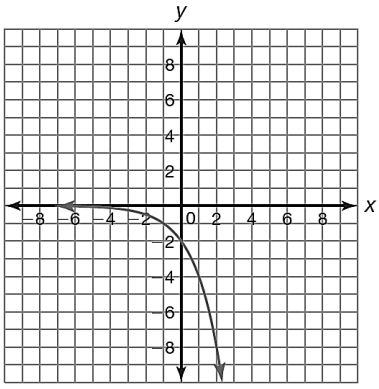
Interval of Increase:

Interval of Decrease:



Interval of Increase:

Interval of Decrease:



Interval of Increase:

Interval of Decrease:

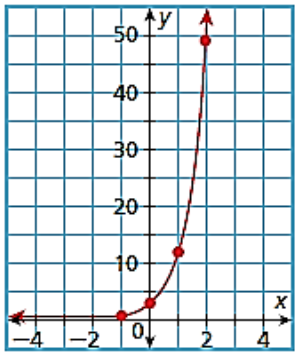
End Behavior

End Behavior

Define:

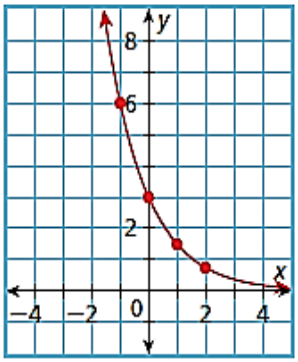
Behavior of the ends of the function (what happens to the y-values or f(x)) as x approaches positive or negative infinity. The arrows indicate the function goes on forever so we want to know where those ends go.

Think:	**Write:**
As x goes to the left (negative infinity), what direction does the left arrow go?	As x → -∞, f(x) → _____
Think:	**Write:**
As x goes to the right (positive infinity), what direction does the right arrow go?	As x → ∞, f(x) → _____



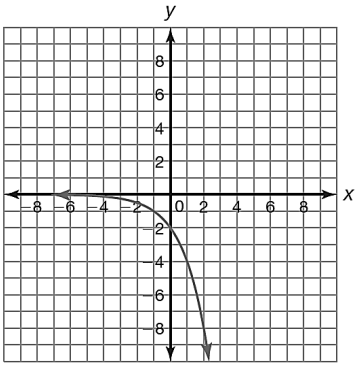
As x approaches -∞, f(x) approaches _____.

As x approaches ∞, f(x) approaches _____.



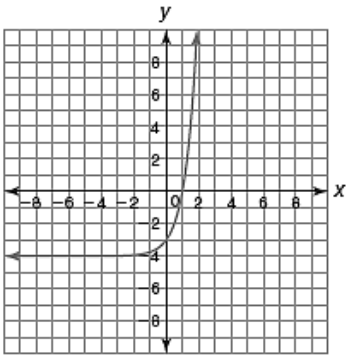
As x approaches -∞, f(x) approaches _____.

As x approaches ∞, f(x) approaches _____.



As x approaches -∞, f(x) approaches _____.

As x approaches ∞, f(x) approaches _____.

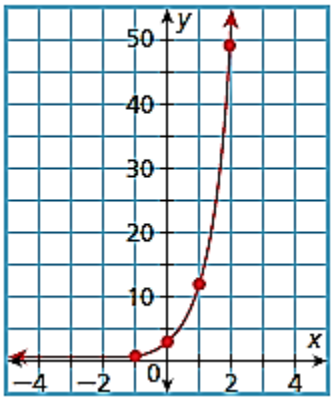


As x approaches -∞, f(x) approaches _____.

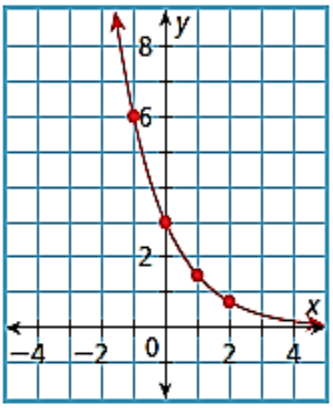
As x approaches ∞, f(x) approaches _____.

Average Rate of Change from a Graph

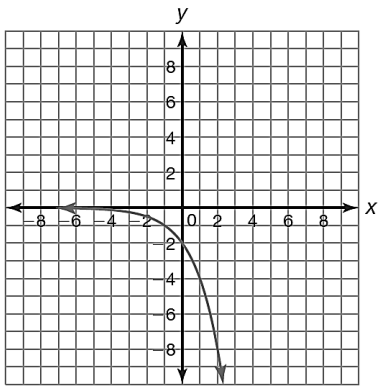
Average Rate of Change: Rate of change or slope for a given interval on a graph. The given interval is written using the inequality notation $a \le x \le b$, where a and b represent the initial and final x-value of the interval.



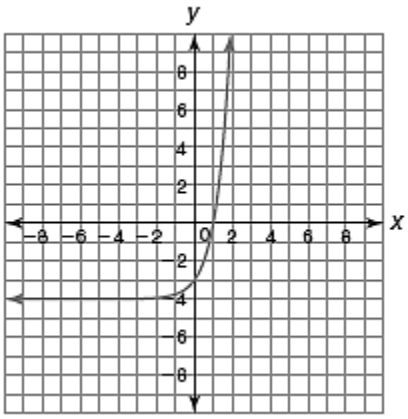
Calculate the average rate of change for the interval $0 \le x \le 2$



Calculate the average rate of change for the interval $-1 \le x \le 2$



Calculate the average rate of change for the interval $0 \le x \le 2$



Calculate the average rate of change for the interval $0 \le x \le 1$

Average Rate of Change from an Equation

If you are given an equation of a function and asked to calculate the average rate of change for that function over a given interval, you will substitute the initial x-value and the final x-value into the function to create two sets of ordered pairs. Then using the ordered pairs, substitute into the slope formula.

a. $y = 3^x$; $1 \le x \le 3$

b. $y = 2(1/2)^x$; $-4 \le x \le 0$