Algebra RH

Essential Question: How can we determine the average rate of change of an exponential function over a specific interval?

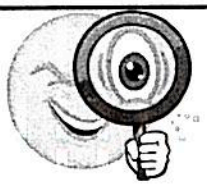
Do Now: Consider the exponential function, $\mathbf{f(x) = 8(2)^x}$.

a) Evaluate f(3).

$f(3) = 8(2)^3$

$= 64$

b) What ordered pair would lie on the graph of f(x) based on f(3)? $(3, 64)$



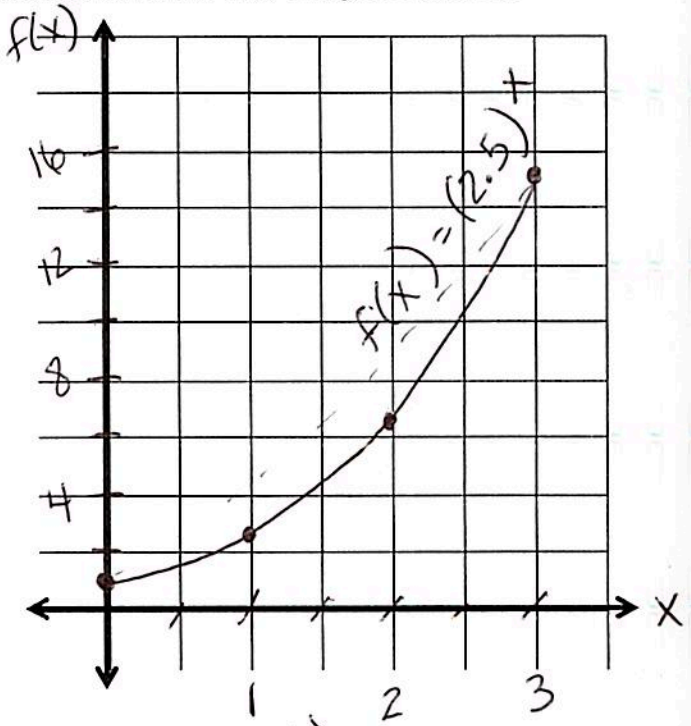
Let's take a closer look at exponential functions.

Make a table of values and graph the following exponential functions over the given interval.

1. Graph $f(x) = (2.5)^x$ over the interval $0 \leq x \leq 3$

x	f(x)
0	1
1	2.5
2	6.25
3	15.625

no arrows



What is the average rate of change of the function over the interval?

Interval begins at: $(0, 1)$

Interval ends at: $(3, 15.625)$

Average Rate of Change:

$$\frac{\Delta y}{\Delta x} = \frac{15.625 - 1}{3 - 0}$$

$$= 4.875$$

a linear function has a constant ROC

an exponential function has an average ROC

2. Consider the exponential function $f(x) = 10(2)^x$.

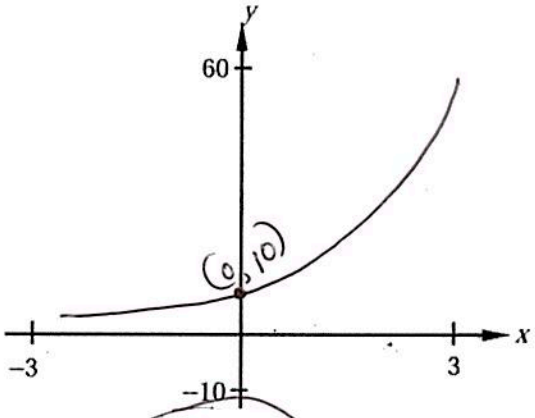
a) Find the value of f(0). What point does this represent on the graph?

$f(0) = 10(2)^0$
$= 10$ y-intercept

b) Is this an increasing or decreasing exponential function? How do you know?

increasing $b > 1$
$2 > 1$

c) Using your calculator, sketch a graph of this function on the axes shown below. Use the window indicated. Mark the y-intercept.



d) What is the function's average rate of change over the interval $-1 \le x \le 2$?

$(-1,5)$ $(2,40)$ $= \frac{40-5}{2-(-1)} = \frac{35}{3} = 11.\overline{6}$ highest, lowest

e) Is this rate of change greater than or less than that of the linear function $g(x) = 10x + 7$? Explain.

$11.\overline{6}$ greater than
$11.\overline{6} > 10$
ROC slope = 10

TAKE AWAY

Exponential functions are curves that either increase or decrease rapidly. We can determine an average rate of change of a specific part of an exponential function by using two points that mark the beginning and end of the interval by calculating $\frac{\Delta y}{\Delta x}$.