A. Lesson Context

BIG PICTURE of this UNIT:	• How can we analyze growth or decay patterns in data sets & contextual problems? • How can we algebraically & graphically summarize growth or decay patterns? • How can we compare & contrast linear and exponential models for growth and decay problems. • How can we extend basic function concepts using exponential functions?

B. Lesson Objectives

i. Study the graphs of exponential functions ➔ Use DESMOS to complete this investigation

PART 1 – Concept Investigations

DESMOS Investigation #1

(a) Graph $y = 2^x$
(b) Then graph $y = a \cdot 2^x$ and add slider
(c) set the slider for a for $1 < a < 10$
(d) play the slider
(e) Now set the slider for $-10 < a < -1$ & play the slider
(f) record observations and describe the effect of "*a*" on the exponential function

Working with Function Notations and Function Concepts

(g) graph $f(x) = 2^x$
(h) graph $y = a \cdot f(x)$ and add slider
(i) set the slider for $1 < a < 10$
(j) play the slider
(k) CONCLUSION ➔ what does a in the equation $y = af(x)$ do? Does it matter what $f(x)$ is?

DESMOS Investigation #2

(a) Graph $y = 2^x$
(b) Then graph $y = 2^{bx}$ and add slider
(c) set the slider for $1 < b < 10$
(d) play the slider
(e) set the slider for $-10 < b < -1$ & play the slider
(f) set the slider for $0 < b < 1$ & play the slider
(g) record observations and describe the effect of "*b*" on the exponential function

Working with Function Notations and Function Concepts

(h) graph $f(x) = 2^x$
(i) graph $y = f(bx)$ and add slider
(j) set the slider for $0 < b < 10$
(k) play the slider
(l) CONCLUSION ➔ what does *b* in the equation $y = f(bx)$ do? Does it matter what $f(x)$ is?

DESMOS Investigation #3

(a) Graph $y = 2^x$
(b) Then graph $y = 2^{x+c}$ and add slider
(c) set the slider for a for $0 < c < 20$
(d) play the slider
(e) Now set the slider for $-20 < c < 0$ & play the slider
(f) record observations and describe the effect of "*c*" on the exponential function

Working with Function Notations and Function Concepts

(g) graph $f(x) = 2^x$
(h) graph $y = f(x + c)$ and add slider
(i) set the slider for $0 < c < 20$
(j) play the slider
(k) CONCLUSION ➔ what does *c* in the equation $y = f(x + c)$ do? Does it matter what $f(x)$ is?

DESMOS Investigation #4

(a) Graph $y = 2^x$
(b) Then graph $y = 2^x + d$ and add slider
(c) set the slider for $0 < d < 20$
(d) play the slider
(e) Now set the slider for $-20 < d < 0$ & play the slider
(f) record observations and describe the effect of "*d*" on the exponential function

Working with Function Notations and Function Concepts

(g) graph $f(x) = 2^x$
(h) graph $y = f(x) + d$ and add slider
(i) set the slider for $0 < d < 20$
(j) play the slider
(k) CONCLUSION ➔ what does *d* in the equation $y = f(x) + d$ do? Does it matter what $f(x)$ is?

CONCLUSION ➔ If you are given an equation like $y = af(b(x + c)) + d$ ➔ what are the transformational effects of *a*, *b*, *c*, *d*