Linear vs. Exponential Functions

Linear and exponential functions share many characteristics. This is because they are based on two different, but similar, sets of principles.

LINEAR VERSUS EXPONENTIAL

Linear functions are based on adding or subtracting the same amount

The slope (m) – Constant rate of change- Common difference

arithmetic sequence

Exponential functions are based on multiplying by the same amount

The base (b)- Growth or decay factor- Common Ratio

geometric sequence

***Example* #1:** The two tables below represent a linear function and an exponential function.

Part 1 : Which type is each function below? Explain how you arrive at your answer.

TABLE 1

x	0	1	2	3	4
y	5	10	20	40	80

$\cdot 2$ $\cdot 2$ $\cdot 2$ $\cdot 2$

Type exponential

TABLE 2

x	0	1	2	3	4
y	8	11	14	17	20

$+3$ $+3$ $+3$ $+3$

Type linear

Linear Regression - Stat Calc 4

Exponential Regression - Stat Calc 0

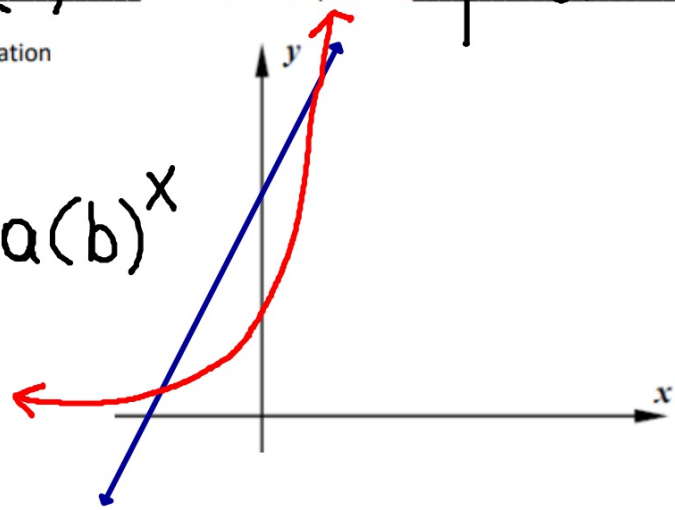
Part 2 **:** Find equations in standard form for each of the functions from *Example* #1.

Table 1 Equation : $y = 5(2)^x$ Table 2 Equation : $y = 3x + 8$

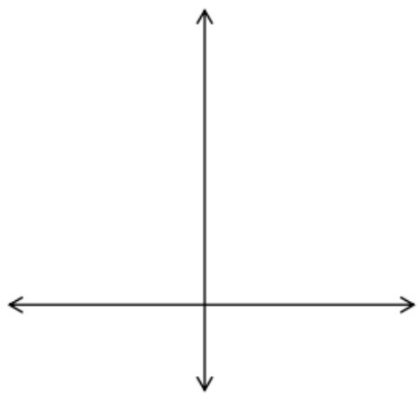
Part 3 **:** Sketch the graph of each equation

exponential

$y = a \cdot b^x$ OR $a(b)^x$



Example 2: Consider the linear function $y = 20x + 5$ and the exponential function $y = 5(2)^2$. Make a sketch of their graphs. Which one of these grows faster?



Example 3

Example 3

Which of the following functions would best describe the data in the table?

~~(1) $y = 10x + 2$~~

~~(2) $y = 8x + 2$~~

(3) $y = 5(2)^x$

(4) $y = 2(5)^x$

x	0	1	2	3	4
y	2	10	50	250	1250

$\cdot 5$ $\cdot 5$ $\cdot 5$ $\cdot 5$

Example 4: Find the equation of the exponential function, in $y = a(b)^x$ form for the function given in the table below.

x	0	1	2	3	4
y	10	30	90	270	810

$\cdot 3$ $\cdot 3$ $\cdot 3$ $\cdot 3$

$y = 10(3)^x$

Linear functions grow through addition while exponential functions grow through multiplication

Example 5: Write an equation of the function represented in the table below.

x	−1	0	1	2	3	4
f(x)	$\frac{2}{3}$	2	6	18	54	162

Type exponential Equation $y = 2(3)^x$