

**LINEAR VERSUS EXPONENTIAL**

Linear functions are based on adding/subtracting the same amount

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

Exponential functions are based on multiplying by the same amount

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

**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

Type

exponential  
Repeated pattern  
of multiplication

**TABLE 2**

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

Type

linear  
Repeated pattern  
of addition

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

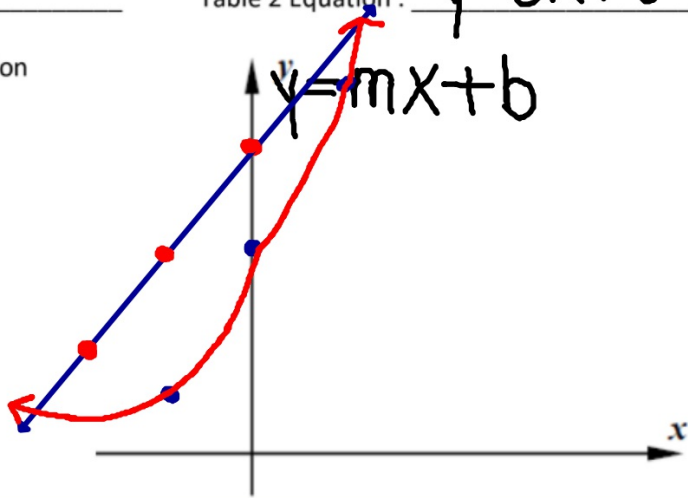
Table 1 Equation :  $y = 5 \cdot 2^x$

Table 2 Equation :  $y = 3x + 8$

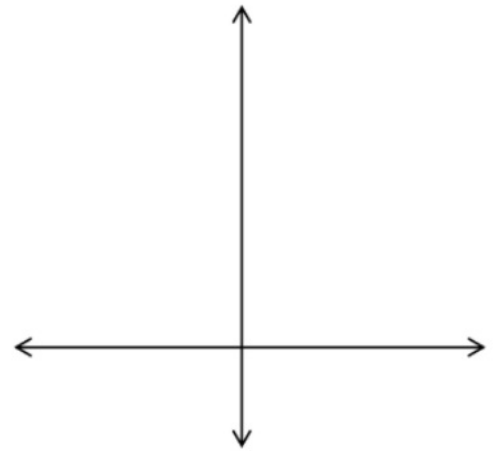
**Part 3 :** Sketch the graph of each equation

$$y = a \cdot b^x$$

$\downarrow$                        $\downarrow$   
y-int                      base  
Ratio



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



**Example 3**

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

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

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

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

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

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

*Handwritten notes: A red circle around the x=0 column. Blue brackets and ".5" below the y-values (2, 10, 50, 250, 1250) indicating a constant multiplier of 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

*Handwritten notes: Blue brackets and ".3" below the y-values (10, 30, 90, 270, 810) indicating a constant multiplier of 3. The text "b = .3" is written to the left.*

*Handwritten equation in a cloud:  $y = 10(3)^x$*

through addition

through multiplication



Linear functions grow \_\_\_\_\_ while exponential functions grow \_\_\_\_\_

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  $y = 2 \cdot (3)^x$

$$\frac{2}{3} \left( \frac{3}{1} \right) = \frac{6}{3} = 2$$