

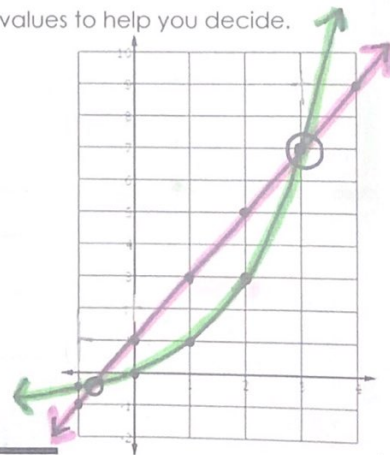
Comparing Linear and Exponential Equations

	Linear	Exponential																				
General Form	$f(x) = mx + b$	$f(x) = a(b)^x$																				
Example	$f(x) = 2x + 3$	$f(x) = 3(2)^x$																				
y-intercept	$b=3$ (0,3)	$a=3$ (0,3)																				
Describe the Change (Do we add or subtract, multiply or divide? By how much?)	Add 2 each time	Multiply by 2 each time																				
Table (Use your calculator to complete the table)	<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>0</td><td>3</td></tr> <tr><td>1</td><td>5</td></tr> <tr><td>2</td><td>7</td></tr> <tr><td>3</td><td>9</td></tr> </table>	x	f(x)	0	3	1	5	2	7	3	9	<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>0</td><td>3</td></tr> <tr><td>1</td><td>6</td></tr> <tr><td>2</td><td>12</td></tr> <tr><td>3</td><td>24</td></tr> </table>	x	f(x)	0	3	1	6	2	12	3	24
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Graph																						
Write a Story to represent the example. Be creative, but be sure to include the y-intercept and the change.	<p>EX: (There are many correct answers) The class started w/ 3 students having A's and each unit we had 2 more earn A's.</p>	<p>EX. A pipe burst at ms. Acton's house. The leak was 3 inches in diameter and doubled in size each hour.</p>																				

Which function increases faster, $f(x) = 2x + 1$ or $g(x) = 2^x - 1$? Make a table of values to help you decide.

x	$f(x) = 2x + 1$
-1	-1
0	1
1	3
2	5
3	7
4	9

x	$g(x) = 2^x - 1$
-1	-1/2
0	0
1	1
2	3
3	7
4	15



Where will the two functions intersect?

At (3,7) and $\approx (-.19, -.25)$

Compare each pair of functions based on their rate of change or y-intercept. Shade the correct statement at the bottom of each box in green.

1. **Function 1:** linear b/c ROC is constant

x	y
-6	0
-5	3
-4	6
-3	9

$\frac{3-0}{-5-(-6)} = \frac{3}{1}$
 $\frac{9-0}{-3-(-6)} = \frac{9}{3} = 3$
ROC = 3

Function 2:
 $y = 5x - 7$
ROC = 5

Function 2 has a greater rate of change.

Function 1 and Function 2 have the same rate of change.

2. **Function 1:**

ROC = $\frac{3}{2}$

Function 2:
 $y = \frac{1}{2}x + 1$
ROC = $\frac{1}{2}$

Function 1 has a greater rate of change on the interval [2,4]

Function 2 has a greater rate of change on the interval [2,4]

3. **Function 1:** $\frac{4-0}{9-2} = \frac{4}{7}$ $\frac{8-4}{16-9} = \frac{4}{7}$

x	2	9	16	23
y	0	4	8	12

Function 2:

ROC = $\frac{4}{7}$

Function 2 has a greater rate of change.

Function 1 and Function 2 have the same

4. **Function 1:**
 $y = 3(2)^x$
 y-intercept

Function 2:

x	y
-1	1/3
0	1
1	3
2	9
3	27

y-int.

Function 1 has a higher y-intercept.

Function 2 has a higher y-intercept.

5. Will and Keller caught lizards at a constant rate throughout the day. The lizards Wes caught are represented by the graph below. The lizards Frank caught is represented in the table. Who caught lizards at a slower rate?

Will's Lizards
ROC: 3

Keller's Lizards
 $\frac{6-2}{3-1} = \frac{4}{2} = 2$

Hours	0	1	3	5
# of Lizards	0	2	6	10

Will caught lizards at a slower rate

Keller caught lizards at a slower rate.

6. Dr. Nelson's students are working on a lab in AP Bio. Group A started with 2430 fruit flies, which are dying by a third each day. Group B started with 1800, which are dying by 300 each day. Which one decreased at a faster rate during Day 1 to Day 3? Which one decreased at a faster rate during Day 4 to Day 5? (Hint: write an equation and create a table)

Group A's die at a faster rate Day 1 - 3. **-360/day**

Group B's die at a faster rate Day 1 - 3. **-300/day**

Group A's die at a faster rate Day 4 - 5. **-20/day**

Group B's die at a faster rate Day 4 - 5. **-300/day**

Group A's die at a faster rate Day 1 - 3. -360/day

Group B's die at a faster rate Day 1 - 3. -300/day

Group A's die at a faster rate Day 4 - 5. -20/day

Group B's die at a faster rate Day 4 - 5. -300/day

* Remember, bc it's linear the ROC is constant... it's not the rate.

7. For each representation below, determine if they are linear or exponential, and then write the equations.

Problem 1, Function 1 Linear or Exponential? $f(x) = 3x + 18$	Problem 3, Function 2 Linear or Exponential? $f(x) = \frac{4}{3}x + 1$	Problem 4, Function 2 Linear or Exponential? $f(x) = 1(3)^x$
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8. What is the key in determining if a scenario is linear or exponential? Circle ALL of the exponential representations above in **pink** and put a box around the linear representations in **blue**.

Linear has a constant ROC (we + or -), exponential (x or ÷)