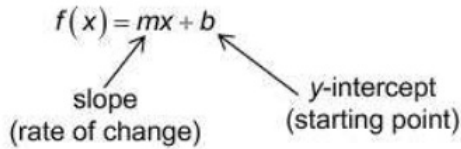
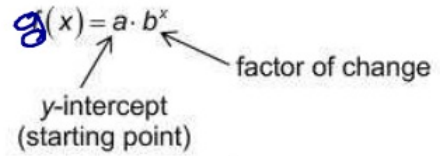


Notes: T3-47 Linear vs. Exponential

Linear vs. Exponential



$f(x) = b + m + m + m + m + m + \dots$



$f(x) = a b b b b b \dots$

Linear Increasing vs. Linear Decreasing		Exponential Growth vs. Exponential Decay																																									
$f(x) = \frac{1}{2}x + 4$ $m: \frac{1}{2}$ $b: 4$	$f(x) = -3x + 6$ $m: -3$ $b: 6$	$f(x) = 2 \cdot 3^x$ $a: 2$ $b: 3$	$f(x) = 16 \left(\frac{1}{4}\right)^x$ $a: 16$ $b: \frac{1}{4}$																																								
<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>-2</td><td>3</td></tr> <tr><td>0</td><td>4</td></tr> <tr><td>2</td><td>5</td></tr> <tr><td>4</td><td>6</td></tr> </table>	x	f(x)	-2	3	0	4	2	5	4	6	<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>-1</td><td>9</td></tr> <tr><td>0</td><td>6</td></tr> <tr><td>1</td><td>3</td></tr> <tr><td>2</td><td>0</td></tr> </table>	x	f(x)	-1	9	0	6	1	3	2	0	<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>-1</td><td>$\frac{2}{3}$</td></tr> <tr><td>0</td><td>2</td></tr> <tr><td>1</td><td>6</td></tr> <tr><td>2</td><td>18</td></tr> </table>	x	f(x)	-1	$\frac{2}{3}$	0	2	1	6	2	18	<table border="1"> <tr><th>x</th><th>f(x)</th></tr> <tr><td>-1</td><td>64</td></tr> <tr><td>0</td><td>16</td></tr> <tr><td>1</td><td>4</td></tr> <tr><td>2</td><td>1</td></tr> </table>	x	f(x)	-1	64	0	16	1	4	2	1
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Fill in the correct rows for each function.

$f(x) = -x - 8$	Linear	Increasing	$m = -1 \quad b = -8$
	Exponential	Decreasing	
$f(x) = 5 \cdot 3^x$	Linear	Growth	$a = \quad b =$
		Decay	$a = \quad b =$
	Exponential	Increasing	$m = \quad b =$
		Decay	$a = 5 \quad b = 3$

Decide if the situation represents a linear increasing function, a linear decreasing function, an exponential growth function, or an exponential decay function. Then write the equation that represents the situation.

- a) Cookie monster starts with 60 cookies and each minute he eats a third of what is left.

Exp. decay.

$$f(x) = 60 \left(\frac{1}{3}\right)^x$$

- b) You have \$75 in the bank and you spend \$15 per week.

Lin Dec

$$f(x) = -15x + 75$$

- c) There are 5 water lilies on a pond and each day the lilies quadruple in number.

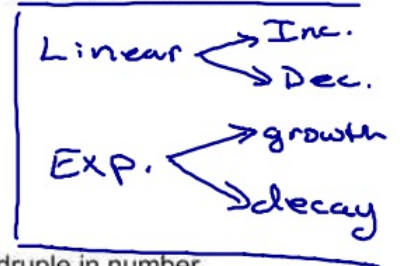
Exp. growth

$$f(x) = 5(4)^x$$

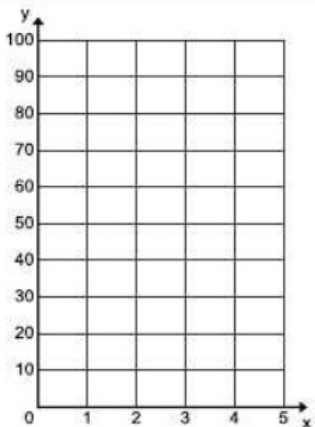
- d) There are 64 basketball teams invited to the NCAA tournament. After each round there are half as many teams as the previous round.

Exp. Decay.

$$f(x) = 64 \left(\frac{1}{2}\right)^x$$



Fill in the table

Context	Table														
<p>With the outbreak of the flu, the health department tracks the number of people who have the flu. They notice that it started with 3 people being sick and doubled per day.</p>	<table border="1"> <tr><td></td><td></td></tr> <tr><td>0</td><td></td></tr> <tr><td>1</td><td></td></tr> <tr><td>2</td><td></td></tr> <tr><td>3</td><td></td></tr> <tr><td>4</td><td></td></tr> <tr><td>5</td><td></td></tr> </table>			0		1		2		3		4		5	
0															
1															
2															
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5															
<p><u>Graph</u></p> 	<p><u>Growth Factor (b):</u></p> <p><u>Start Point (a):</u></p> <p><u>Equation:</u></p>														

WS: T3-47 Linear vs. Exponential

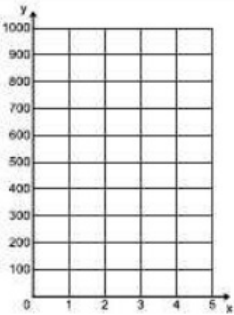
Decide if the situation represents a linear increasing function, a linear decreasing function, an exponential growth function, or an exponential decay function. Then write the equation that represents the situation.

1. A geologist discovers a radioactive material that starts with 1,200 particles and has a half-life of one day.
2. A marathon runner starts by running 3 miles and then adds an additional 4 miles per week to his workout schedule.
3. The value of a car starts at \$15,000 and drops \$1000 per year it is owned.
4. Madden started a rumor and the number of students who heard the rumor doubled every hour.
5. An investor gains \$500 per year on his \$10,000 investment.
6. A clearance item was \$200, but is marked down 50% per day for an entire week.

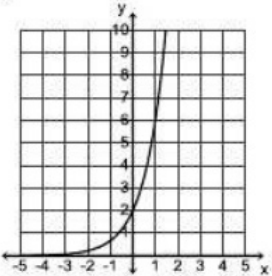
Fill in the correct rows for each function.

7. $f(x) = 7 \cdot 1.5^x$	Linear	Increasing	$m =$	$b =$
		Decreasing		
	Exponential	Growth	$a =$	$b =$
		Decay		
8. $f(x) = \frac{3}{2}x + 1$	Linear	Increasing	$m =$	$b =$
		Decreasing		
	Exponential	Growth	$a =$	$b =$
		Decay		
9. $f(x) = \left(\frac{2}{3}\right)^x$	Linear	Increasing	$m =$	$b =$
		Decreasing		
	Exponential	Growth	$a =$	$b =$
		Decay		

10.

<p><u>Context</u></p> <p>There are 800 downloads of a new song the day it is released. Each day after the release date, there are half as many downloads of the song.</p>	<p><u>Table</u></p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Day</th> <th style="padding: 5px;">Downloads</th> </tr> </thead> <tbody> <tr><td style="padding: 5px;">0</td><td style="padding: 5px;"></td></tr> <tr><td style="padding: 5px;">1</td><td style="padding: 5px;"></td></tr> <tr><td style="padding: 5px;">2</td><td style="padding: 5px;"></td></tr> <tr><td style="padding: 5px;">3</td><td style="padding: 5px;"></td></tr> <tr><td style="padding: 5px;">4</td><td style="padding: 5px;"></td></tr> <tr><td style="padding: 5px;">5</td><td style="padding: 5px;"></td></tr> </tbody> </table>	Day	Downloads	0		1		2		3		4		5	
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0															
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<p><u>Graph</u></p> 	<p><u>Decay Factor (b):</u></p> <p><u>Start Point (a):</u></p> <p><u>Equation:</u></p>														

11. For each box below, decide if each equation, context, table, or graph is linear or exponential. ***Explain your answer and identify the y-intercept and the rate of change or factor of change.*** If it is linear, state if it is increasing or decreasing. If it is exponential, state if it is growth or decay.

<p>a)</p> $f(x) = 3x$	<p>b)</p> 												
<p>c)</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">x</th> <th style="padding: 5px;">$f(x)$</th> </tr> </thead> <tbody> <tr><td style="padding: 5px;">-1</td><td style="padding: 5px;">100</td></tr> <tr><td style="padding: 5px;">0</td><td style="padding: 5px;">50</td></tr> <tr><td style="padding: 5px;">1</td><td style="padding: 5px;">25</td></tr> <tr><td style="padding: 5px;">2</td><td style="padding: 5px;">12.5</td></tr> <tr><td style="padding: 5px;">3</td><td style="padding: 5px;">6.25</td></tr> </tbody> </table>	x	$f(x)$	-1	100	0	50	1	25	2	12.5	3	6.25	<p>d)</p> <p>Rachel writes 2 notes per class period to give to her friends.</p>
x	$f(x)$												
-1	100												
0	50												
1	25												
2	12.5												
3	6.25												