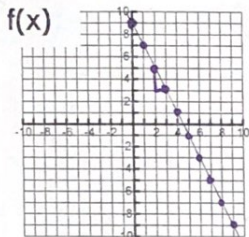


Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Comparing Linear and Exponential Functions**

1. The functions  $f(x)$  and  $g(x)$  are described below. Compare the **rate of change** and **intercepts** of each.



Rate of Change:  $-2$

y-intercept:  $(0, 9)$

x-intercept:  $(4.5, 0)$

Equation:  $y = -2x + 9$

x	g(x)
-2	-10
-1	-8
0	-6
1	-4

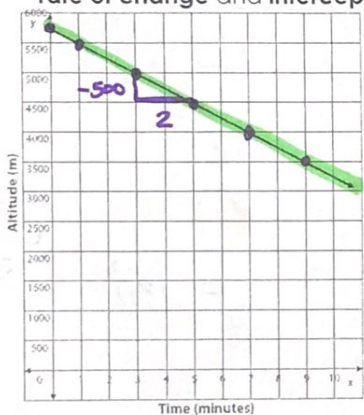
ROC:  $2$

y-int:  $(0, -6) + 1$

x-int:  $(3, 0) + 1$

Equation:  $y = 2x - 6$

2. Two airplanes are in flight. The function  $f(x) = -100x + 3,350$  represents the altitude,  $f(x)$ , of one airplane after  $x$  minutes. The graph below represents the altitude of the second airplane,  $g(x)$ . Compare the **rate of change** and **intercepts** of the functions.



$0 = -100x + 3350$   
 $-3350 = -100x$   
 $\frac{-3350}{-100} = \frac{-100x}{-100}$   
 $x = 33.5$

$f(x) = -100x + 3350$

f(x)  
 ROC:  $-100$

y-int:  $3350$  or  $(0, 3350)$

x-int:  $(33.5, 0)$   
 (have to solve for)

decreases 250 m per minute

g(x)  
 ROC:  $\frac{-500}{2} = -250$

y-int:  $(0, 5750)$  ← It starts at 5750m.

x-int:  $(23, 0)$   
 (solve since graph doesn't show) ← it will hit the ground after 23 min.

$y = -250x + 5750$

$0 = -250x + 5750$   
 $-5750 = -250x$   
 $\frac{-5750}{-250} = \frac{-250x}{-250}$   
 $x = 23$

Would the two planes ever be at the same altitudes?

$-100x + 3350 = -250x + 5750 \rightarrow 150x = 2400 \rightarrow x = 16$  yes

3. Compare the **rate of change** of each function.

ROC  $\frac{29.25 - 0}{25 - 0} = 1.17$

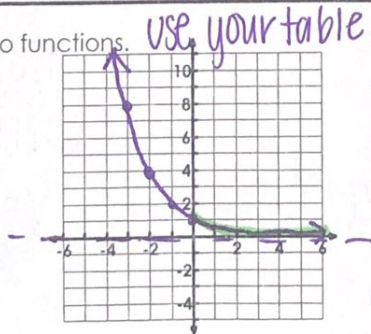
Function A	
Number of beverages sold (x)	Profit $f(x)$
$x_1 = 0$	$y_1 = 0$
$x_2 = 25$	$y_2 = 29.25$
$x_3 = 50$	$y_3 = 58.50$

Function B  
 For each hamburger sold, the restaurant makes \$0.40.

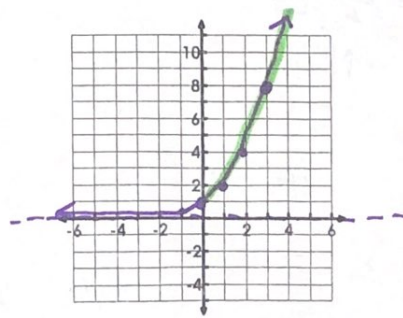
The rate of change is higher for beverages sold than for hamburgers sold.

4. Graph the two functions.

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



$f(x) = 2^x$



a. Which function has a greater **rate of change** over the interval  $[0, 5]$ ? The 2nd one (much steeper)

Determine if the following representations are linear or exponential, identify the characteristics, and then write an equation.

<p>5.</p>	<p>6.</p> <p>Kate started with 500 Instagram followers. Each week, she gained 150 more.</p>	<p>7.</p>																								
<p>Linear or Exponential</p> <p>ROC from [0,5]: <math>\frac{2}{5}</math></p> <p>x-intercept: <math>(-5, 0)</math></p> <p>y-intercept: <math>(0, 2)</math></p> <p>Equation: <math>f(x) = y = \frac{2}{5}x + 2</math></p>	<p>Linear or Exponential</p> <p>ROC from [0,4]: 150</p> <p>x-intercept:</p> <p>y-intercept:</p> <p>Equation: <math>f(x) = y = 150x + 500</math></p>	<p>Linear or Exponential</p> <p>ROC from [1,2]: 3</p> <p>x-intercept: None</p> <p>y-intercept: <math>(0, 1)</math></p> <p>Equation: <math>f(x) = y = 1(3)^x</math></p>																								
<p>8.</p> <p>ROC [0,2]</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>-1</td> <td><math>x_1, 0</math></td> <td>1</td> <td><math>2x_2</math></td> </tr> <tr> <td>y</td> <td>1/2</td> <td><math>y_1, 2</math></td> <td>8</td> <td><math>32y_2</math></td> </tr> </table> <p style="text-align: center;">x4   x4   x4</p>	X	-1	$x_1, 0$	1	$2x_2$	y	1/2	$y_1, 2$	8	$32y_2$	<p>9.</p> <p>Diego had 2 YouTube followers on his music channel. He dropped a new single, and each day after, his number of subscribers tripled.</p>	<p>10.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Y</td> <td>12</td> <td>9</td> <td>6</td> <td>3</td> <td>0</td> <td>-3</td> </tr> </table> <p style="text-align: center;">-3   -3   -3   -3</p>	X	0	1	2	3	4	5	Y	12	9	6	3	0	-3
X	-1	$x_1, 0$	1	$2x_2$																						
y	1/2	$y_1, 2$	8	$32y_2$																						
X	0	1	2	3	4	5																				
Y	12	9	6	3	0	-3																				
<p>Linear or Exponential</p> <p>ROC from [0,2]: <math>\frac{32-2}{2-0} = \frac{30}{2} = 15</math></p> <p>x-intercept: None</p> <p>y-intercept: <math>(0, 2)</math></p> <p>Equation: <math>f(x) = y = 2(4)^x</math></p>	<p>Linear or Exponential</p> <p>ROC from [0,5]: <math>\frac{486-2}{6-0} = \frac{484}{6} = 98.6</math></p> <p>x-intercept: None</p> <p>y-intercept: <math>(0, 2)</math></p> <p>Equation: <math>f(x) = y = 2(3)^x</math></p>	<p>Linear or Exponential</p> <p>ROC from [2,5]: -3</p> <p>x-intercept: <math>(4, 0)</math></p> <p>y-intercept: <math>(0, 12)</math></p> <p>Equation: <math>f(x) = y = -3x + 12</math></p>																								

0	1	2
1	3	9

x3   x3

X	0	1	2	3	4	5	X <sub>2</sub>
y	2	6	18	54	162	486	y <sub>2</sub>