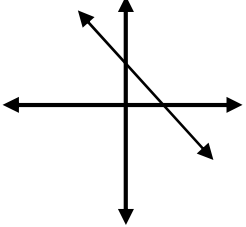


# LINEAR VS. NON-LINEAR FUNCTIONS

A function that is linear will have a \_\_\_\_\_ rate of change and can be distinguished from non-linear functions in each of the following representations:

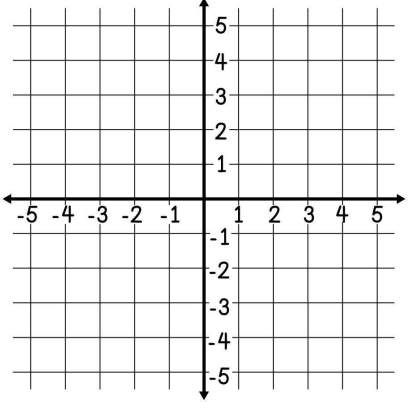
LINEAR EQUATIONS	LINEAR TABLES	LINEAR GRAPHS										
<p>Can be written in the form of _____</p> <p style="text-align: center; font-size: 1.2em;"><math>y = 2x - 3</math></p>	<p>A _____ rate of change; as the _____ change by a constant value, the _____ will change by a constant value</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">9</td> </tr> <tr> <td style="padding: 5px;">y</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">8</td> </tr> </table>	x	0	3	6	9	y	2	4	6	8	<p>The graph will form a _____ line</p> <div style="text-align: center;">  </div>
x	0	3	6	9								
y	2	4	6	8								

In 1-2, use the given equation to fill out a table of values and create a graph. Then, identify the function as linear or non-linear. Justify your choice based on each representation.

1

$$y = \frac{1}{2}x$$

x	-4	-2	0	2	4
y					



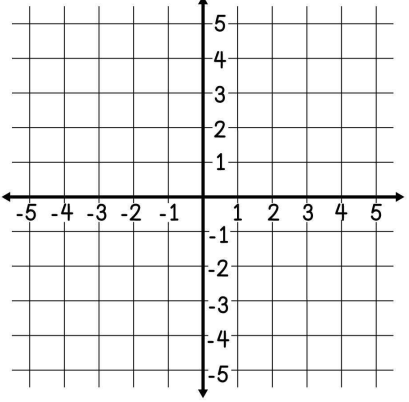
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IS THE FUNCTION LINEAR?

2

$$y = x^2 + 1$$

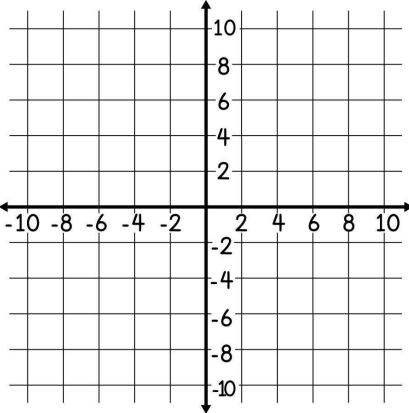
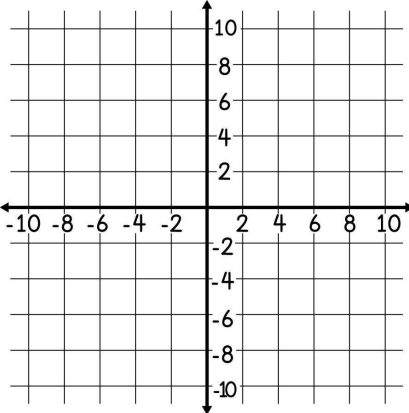
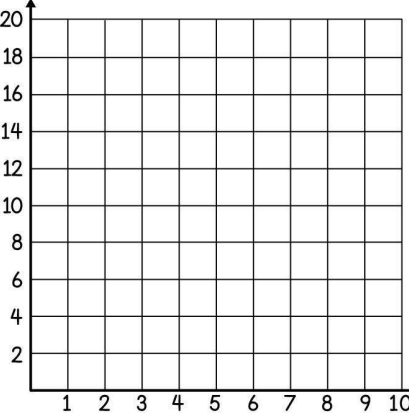
x	-2	-1	0	1	2
y					



---

IS THE FUNCTION LINEAR?

Use each given function to create a table and graph. Then, explain if the function is linear or not.

<p>3.</p> $y = x^3$ <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="background-color: #cccccc;">x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td style="background-color: #cccccc;">y</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>  <p><b>LINEAR?</b></p>	x	-2	-1	0	1	2	y						<p>4.</p> $y = 1.5x + 2$ <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="background-color: #cccccc;">x</td> <td>-4</td> <td>-2</td> <td>0</td> <td>2</td> <td>4</td> </tr> <tr> <td style="background-color: #cccccc;">y</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>  <p><b>LINEAR?</b></p>	x	-4	-2	0	2	4	y						<p>5.</p> $y = \frac{12}{x}$ <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="background-color: #cccccc;">x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>6</td> </tr> <tr> <td style="background-color: #cccccc;">y</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>  <p><b>LINEAR?</b></p>	x	1	2	3	4	6	y					
x	-2	-1	0	1	2																																	
y																																						
x	-4	-2	0	2	4																																	
y																																						
x	1	2	3	4	6																																	
y																																						

Apply your knowledge of linear and non-linear functions to answer 6-8.

<p>6. Todd noticed that both proportional and linear relationships form a straight line when graphed, and he concludes that all linear relationships must be proportional. Do you agree? Why or why not?</p>	<p>7. Label each of the functions below as linear or non-linear.</p> <p>a. <math>y = 4x^2</math></p> <p>b. <math>y = -x - 1</math></p> <p>c. <math>y = \frac{10}{x}</math></p>
--	--

8. Several students made statements about the relationship between x and y shown in the table. Circle the name of any student who made a correct statement.

x	0	2	4	6	8
y	0	-4	-16	-36	-64

**TABITHA**

The relationship is non-linear because as x increases, y decreases.

**ARTURO**

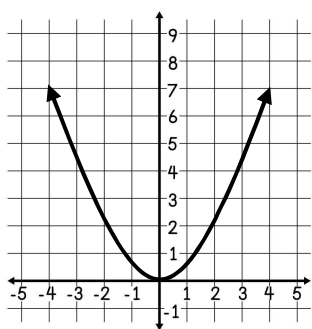
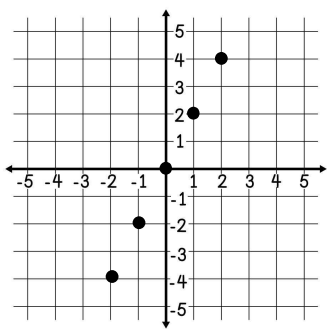
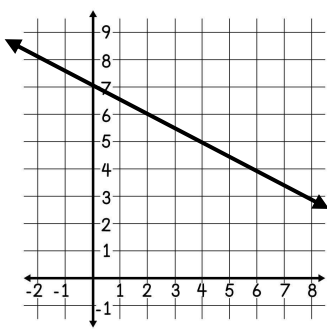
The relationship is non-linear because as x changes by a constant value, the y-values do not change by a constant value.

**LUKE**

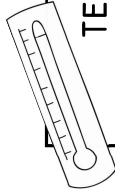
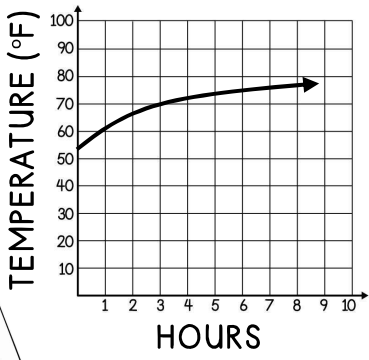

A graph of the relationship would not show a straight line.

# LINEAR VS. NON-LINEAR FUNCTIONS

Label each of the following functions as “linear” or “non-linear”. Be sure to explain your choice.

<p>1. <math>y = 3x^3 - 3</math></p>	<p>2. <math>y = 8.75x</math></p>	<p>3. <math>y = \frac{10}{x}</math></p>
<p>4. </p>	<p>5. </p>	<p>6. </p>

<p>7.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;"><b>x</b></td> <td>3</td> <td>6</td> <td>9</td> <td>12</td> </tr> <tr> <td><b>y</b></td> <td>12</td> <td>-3</td> <td>-18</td> <td>-33</td> </tr> </table>	<b>x</b>	3	6	9	12	<b>y</b>	12	-3	-18	-33	<p>8.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;"><b>x</b></td> <td>5</td> <td>10</td> <td>15</td> <td>20</td> </tr> <tr> <td><b>y</b></td> <td>2</td> <td>1</td> <td><math>\frac{2}{3}</math></td> <td><math>\frac{1}{2}</math></td> </tr> </table>	<b>x</b>	5	10	15	20	<b>y</b>	2	1	$\frac{2}{3}$	$\frac{1}{2}$
<b>x</b>	3	6	9	12																	
<b>y</b>	12	-3	-18	-33																	
<b>x</b>	5	10	15	20																	
<b>y</b>	2	1	$\frac{2}{3}$	$\frac{1}{2}$																	

<p>9. The graph shows the change in temperature in Monterey, CA over several hours. Is the relationship between the number of hours and temperature linear or non-linear? Explain.</p> <div style="display: flex; align-items: center;">   </div>	<p>10. The table shows the height of a softball that Hallie threw in the air. Is the relationship shown linear? Why or why not?</p> <div style="text-align: right; margin-bottom: 10px;">  </div> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">TIME (SEC)</th> <th style="width: 50%;">HEIGHT (YDS)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>0.5</td> <td>7.2</td> </tr> <tr> <td>1</td> <td>10.7</td> </tr> <tr> <td>1.5</td> <td>11.5</td> </tr> <tr> <td>2</td> <td>12.2</td> </tr> </tbody> </table>	TIME (SEC)	HEIGHT (YDS)	0	0	0.5	7.2	1	10.7	1.5	11.5	2	12.2
TIME (SEC)	HEIGHT (YDS)												
0	0												
0.5	7.2												
1	10.7												
1.5	11.5												
2	12.2												