

NAME OF FUNCTION	GENERAL SHAPE OF GRAPH	SKETCH
LINEAR	A <u>LINE</u> $y = mx + b$	
QUADRATIC	A "U" <u>PARABOLA</u> $y = ax^2 + bx + c$	
EXPONENTIAL	A <u>FLAT AND CURVEY</u> $y = a(b)^x$	

1. Complete the following tables and answer the questions to the right.

(a)

X	$y = 2x$	1st Diff
-3	-6	2 (-4 - -6)
-2	-4	
-1	-2	2 (-2 - -4)
0	0	2 (0 - -2)
1	2	2 (2 - 0)
2	4	2 (4 - 2)
3	6	2 (6 - 4)

This function is.

linear     quadratic     exponential

Describe two ways you were able to determine what this function is:

- THE EQUATION IS JUST  $x$
- THE FIRST DIFFERENCE IS ALL THE SAME

(b)

x	$y = x^2$	1st Diff	2nd Diff
-3	9	-5 (4-9)	2 (-3--5)
-2	4		
-1	1	-3 (1-4)	2 (-1--3)
0	0	-1 (0-1)	2 (1--1)
1	1	1 (1-0)	2 (3-1)
2	4	3 (4-1)	2 (5-3)
3	9	5 (9-4)	

↑  
NOT THE SAME SO  
NOT LINEAR!

This function is.

linear     quadratic     exponential

How do you know?

- THE EQUATION IS  $x^2$
- THE 2ND DIFFERENCE IS THE SAME (2ND FOR  $x^2$ !)

(c)

x	y = 2 <sup>x</sup>	1 <sup>st</sup> Diff	2 <sup>nd</sup> Diff
-3	.125 = $\frac{1}{8}$	$\frac{1}{8} (\frac{1}{4} - \frac{1}{8})$	$\frac{1}{8} (\frac{1}{4} - \frac{1}{8})$
-2	.25 = $\frac{1}{4}$		
-1	.5 = $\frac{1}{2}$	$\frac{1}{4} (\frac{1}{2} - \frac{1}{4})$	$\frac{1}{4} (\frac{1}{2} - \frac{1}{4})$
0	1	$\frac{1}{2} (1 - \frac{1}{2})$	$\frac{1}{2} (1 - \frac{1}{2})$
1	2	1 (2-1)	1 (2-1)
2	4	2 (4-2)	2 (4-2)
3	8	4 (8-4)	

What do you notice about the differences in this function?  
NONE OF THEM ARE THE SAME; THEY MATCH THE TERMS PREVIOUSLY.  
 By what number is the first difference multiplied by to get the next term in the sequence of y-values?  
2  
 How does this value connect to the function?  
IT IS THE RATE!  
 This function is.  linear  quadratic  exponential  
 What methods can you use to verify the type of function selected? LOOK FOR X AS AN EXPONENT  
NO COMMON DIFFERENCES

2. Use differences to identify the type of function represented by the table of values. Then label which type of function each table of values models.

x	y		x	y		x	y		x	y	
-4	5	$3 > 2$ $5 > 2$ $7 > 2$ $9 > 2$ $11 > 2$	-5	32	$-16 > 8$ $-8 > 4$ $-4 > 2$ $-2 > 1$ $-1$	-2	8	$-4 > 2$ $-2 > 1$ $-1 > \frac{1}{2}$ $-\frac{1}{2} > \frac{1}{4}$ $-\frac{1}{4}$	0.5	0.9	$.2$ $.2$ $.2$ $.2$ $.2$
-3	8		-4	16		-1	4		0.75	1.1	
-2	13		-3	8		0	2		1	1.3	
-1	20		-2	4		1	1		1.25	1.5	
0	29		-1	2		2	.5		1.5	1.7	
1	40		0	1		3	.25		1.75	1.9	

Function: QUADRATIC!

Function: EXPONENTIAL!

Function: EXPONENTIAL!

Function: LINEAR!

Identify the following equations as linear, quadratic or exponential.

1. $y = 10\left(\frac{1}{3}\right)^x$ <input type="checkbox"/> linear <input type="checkbox"/> quadratic <input checked="" type="checkbox"/> exponential	2. $y = 5 + 7(x)$ <input checked="" type="checkbox"/> linear <input type="checkbox"/> quadratic <input type="checkbox"/> exponential
3. $y = (x + 3)^2 - 4$ <input type="checkbox"/> linear <input checked="" type="checkbox"/> quadratic <input type="checkbox"/> exponential	4. $y = -2(x) + 5$ <input checked="" type="checkbox"/> linear <input type="checkbox"/> quadratic <input type="checkbox"/> exponential
5. $y = -\frac{1}{2}(3)^x$ <input type="checkbox"/> linear <input type="checkbox"/> quadratic <input checked="" type="checkbox"/> exponential	6. $y = \frac{1}{3}(x)^2 - 4$ <input type="checkbox"/> linear <input checked="" type="checkbox"/> quadratic <input type="checkbox"/> exponential

Graph the functions  $y = 2x$ ,  $y = x^2$  and  $y = 2^x$  on the same grid for. **Label your graphs.**

$y = 2x$

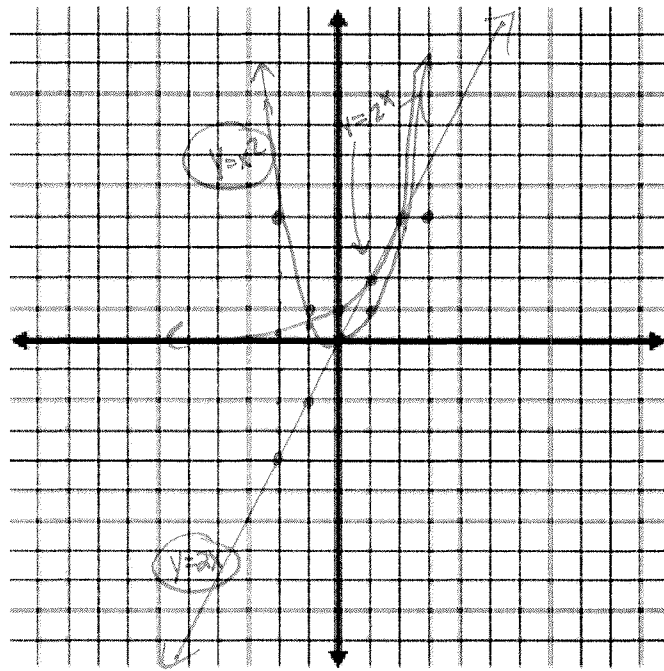
X	Y
-2	-4
-1	-2
0	0
1	2
2	4

$y = x^2$

X	Y
-2	4
-1	1
0	0
1	1
2	4

$y = 2^x$

X	Y
-2	.25
-1	.5
0	1
1	2
2	4



**Looking at the graphs above:**

a) Which function equation shows a constant rate of change in its y values?  
How is this displayed on your graph?

$y = 2x$  IT IS A STRAIGHT LINE

b) For  $x < 4$  which function shows the fastest rate of change in its y values? (Look at table)  
How is this displayed on your graph?

HOW ARE THE RATES OF CHANGE DIFFERENT FOR EACH GRAPH?  
 LINEAR = SAME RATE OF CHANGE  
 QUADRATIC = RATE OF CHANGE DECREASES THEN INCREASES  
 EXPONENTIAL = RATE OF CHANGE IS SLOW THEN FAST

c) Eventually, which type of function shows the most rapid rate of growth in its y values?  
How is this displayed on your graph?

**Practice Problems**

Identify the following equations as linear, quadratic or exponential.

1.  $y = 4^x + 6$  EXPONENTIAL

2.  $y = -\frac{3}{2}x - 3$  LINEAR

3.  $y = x^2 - 5x + 6$  QUADRATIC

4.  $y = -2(4)^x$  EXPONENTIAL

5.  $y = 3x + 3$  LINEAR

6.  $f(x) = (x - 2)^2 + 7$  QUADRATIC