AChor/MBF3C **Name:** _____
Date: _____

Worksheet 5-5: Rates of Change/Growth

How do we identify linear, quadratic or exponential relations?

1. **Classify by Equation:**
   - ☺ Linear: *x* is a first-degree variable (Exponent is 1).
   - ☺ Quadratic: *x* is a second-degree variable (Exponent is 2).
   - ☺ Exponential: *x* itself is the exponent.

2. **Classify by Graph:**
   - ☺ Linear: the graph is a straight line.
   - ☺ Quadratic: the graph is a parabola (U-shape).
   - ☺ Exponential: the graph is an exponential curve (J-shaped).

3. **Classify by Finite Differences:**
   - ☺ Linear: first differences are constant.
   - ☺ Quadratic: first differences increase by a constant value (adding). Second differences are constant.
   - ☺ Exponential: first differences increase by a constant factor (multiplying), a common ratio.

Check for Understanding:

1. Without graphing, classify each of the following as linear, quadratic, or exponential growth.

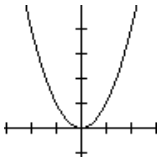
(a) $3x - 4y = 12$ Linear Quadratic Exponential

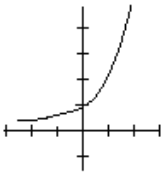
(b) $y = 2x^2 + 3$ Linear Quadratic Exponential

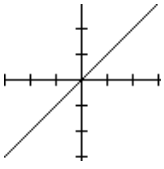
(c) $y = \left(\frac{1}{5}\right)^x$ Linear Quadratic Exponential

(d) $y = 3(1.05)^x$ Linear Quadratic Exponential

2. Examine each graph and classify as linear, quadratic, or exponential growth.

(a)  Linear Quadratic Exponential

(b)  Linear Quadratic Exponential

(c)  Linear Quadratic Exponential

Assigned Work: WS 5-5; p. 390 #1-2, #9, #13

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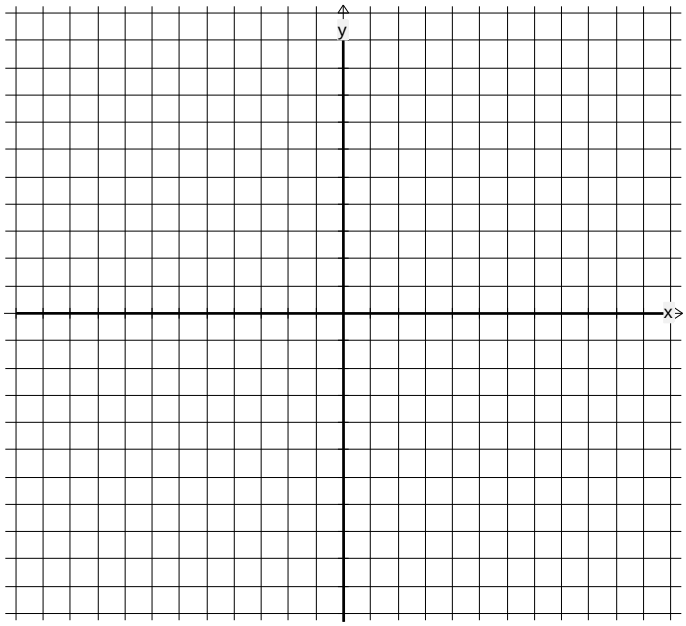
Investigation:

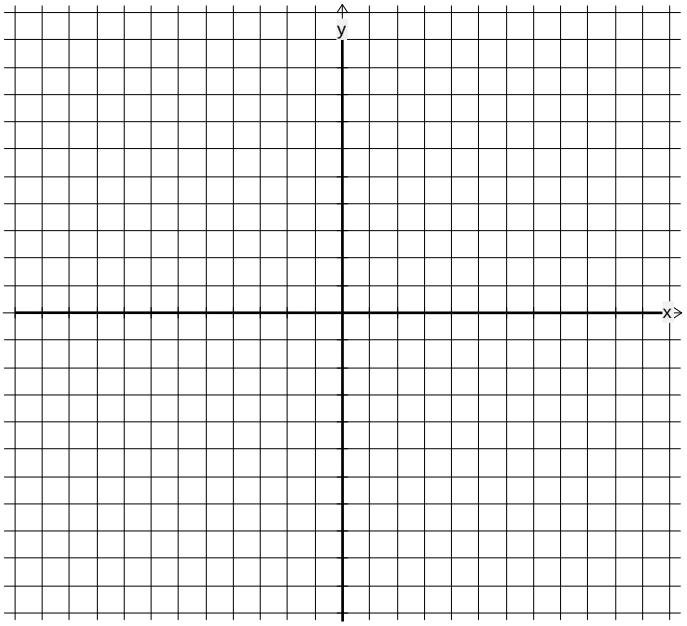
1. Graph $y = 2x$.

x	$y = 2x$	First Difference
-3		
-2		
-1		
0		
1		
2		
3		



2. Graph $y = 2x^2$.

x	$y = 2x^2$	First Difference
-3		
-2		
-1		
0		
1		
2		
3		



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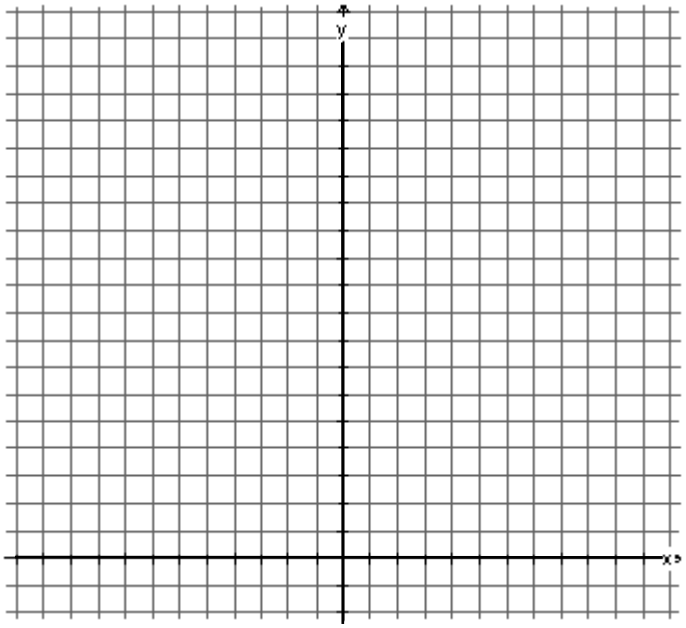
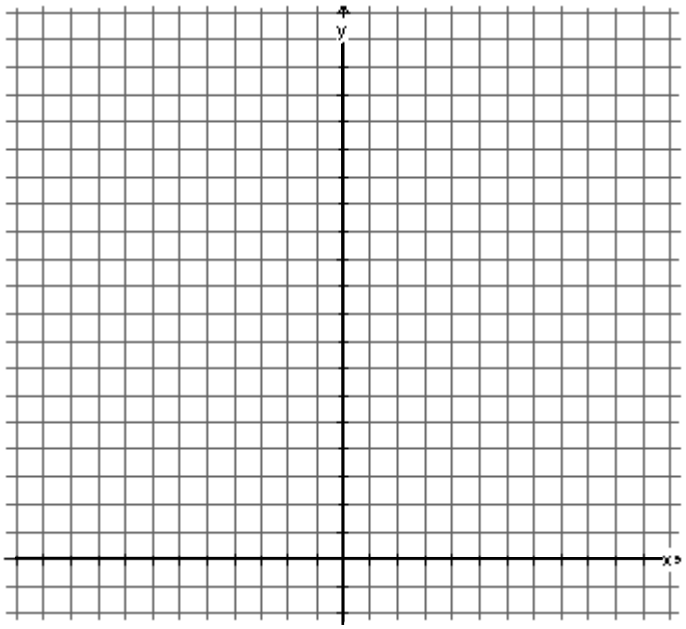
3. Graph $y = 2^x$.

x	$y = 2^x$	First Difference
-3		
-2		
-1		
0		
1		
2		
3		



4. Graph $y = \left(\frac{1}{2}\right)^x$.

x	$y = \left(\frac{1}{2}\right)^x$	First Difference
-3		
-2		
-1		
0		
1		
2		
3		



5. Conclusions:

☺ $y = 2x$ is a(n) _____ relation because *x* is a first-degree variable.

So, the graph is a(n) _____ and it represents

_____ growth.

☺ $y = 2x^2$ is a(n) _____ relation because *x* is a second-degree variable.

So, the graph is a(n) _____ and it represents

_____ growth.

☺ $y = 2^x$ is a(n) _____ relation because *x* is an exponent.

So, the graph is a(n) _____ and it represents

_____ growth.

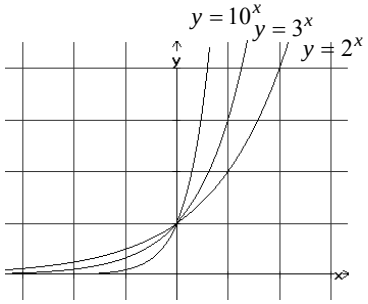
☺ $y = \left(\frac{1}{2}\right)^x$ is a(n) _____ relation because *x* is an exponent.

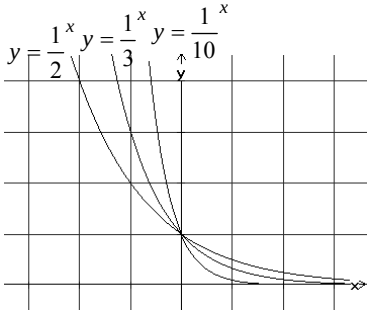
So, the graph is a(n) _____ and it represents

exponential _____.

Note:

For exponential relation $y = b^x$, the curve gets closer to the *y*-axis as *b* increases when $b > 1$ or as *b* decreases (denominator of *b* increases) when $0 < b < 1$ (a fraction or a decimal less than 1).





Check for Understanding:

Create the next diagram following the given pattern, and determine what type of relation is represented.

Diagram 1 Diagram 2 Diagram 3