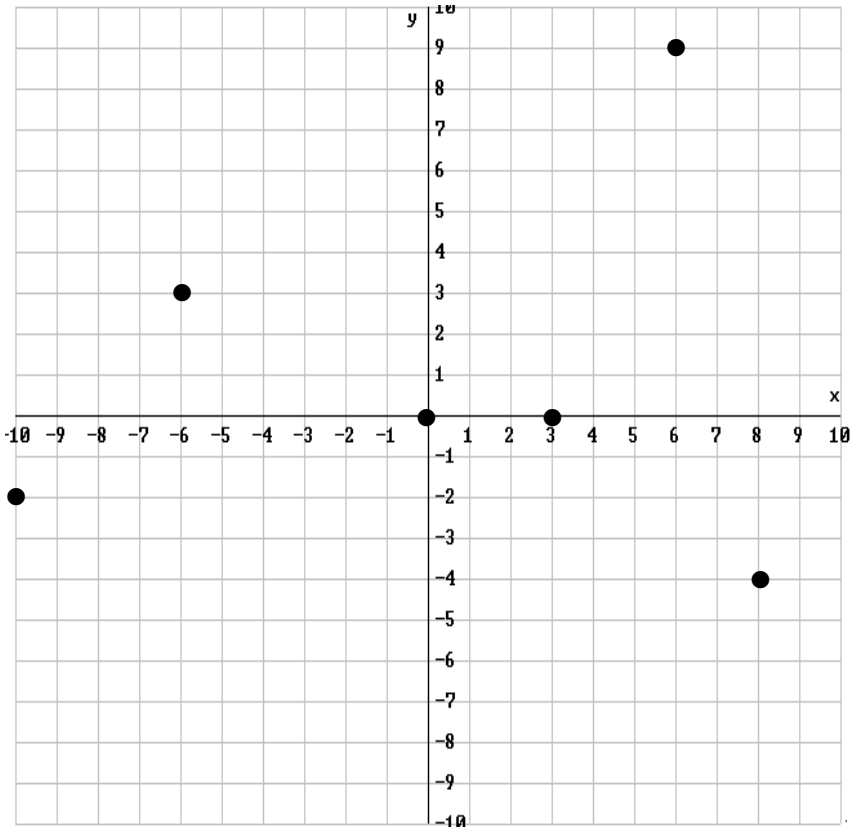
Linear Equations in Two Variables

Linear Equations in Two Variables

Cartesian Coordinate System:



Linear Equations in Two Variables

A **linear equation in two variables** is an equation that describes an infinite set of ordered pairs (x, y).

Example 1 Complete the table of ordered pairs that satisfy the linear equation $x + y = 6$.

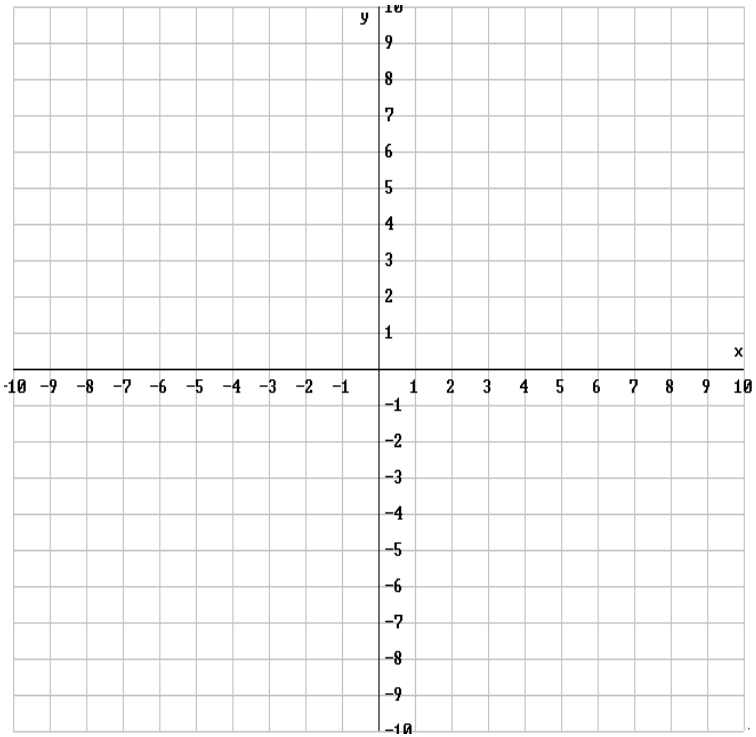
x	y
0	
	0
1	
	3

Linear Equations in Two Variables

The graph of a **linear equation** is a straight line.

Example 2 Graph the equation $x + y = 6$.

x	y
0	6
6	0
1	5
3	3



Linear Equations in Two Variables

$y = mx + b$ is the **slope-intercept form** of the equation of a line, where m is the **slope** and the point $(0, b)$ is the **y-intercept** (i.e., the point where the graph crosses the y-axis).

Example 3 Write the equation $x + y = 6$ in slope-intercept form and determine the slope and y-intercept of the line.

slope = _____

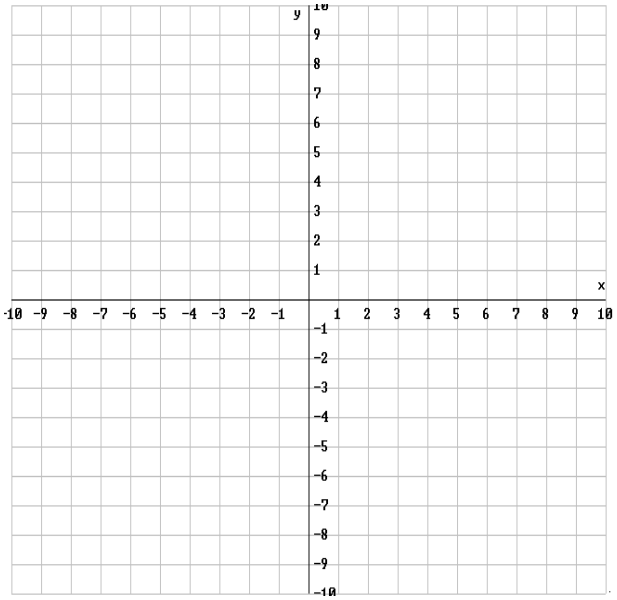
The y-intercept occurs at y = _____

Linear Equations in Two Variables

The **slope (m)** of a line is the *steepness* of the line.

That is, $m = \dfrac{\text{rise}}{\text{run}}$.

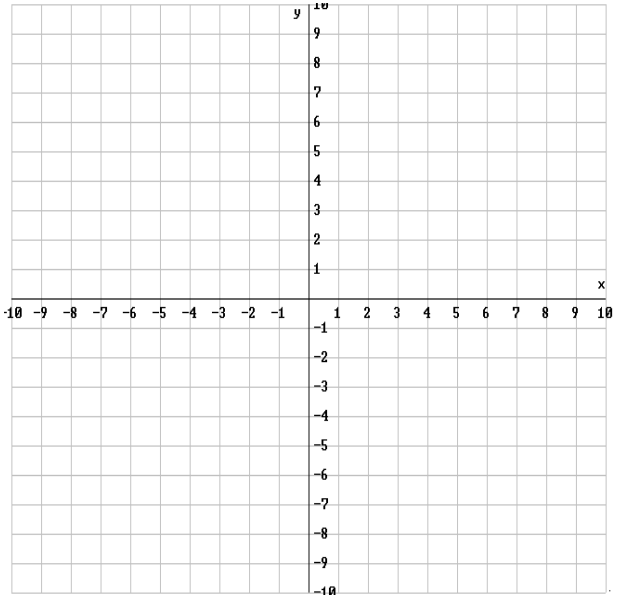
Example 4 Consider the equation $y = -x + 6$. Use the slope and the y-intercept to graph the equation.



Linear Equations in Two Variables

Slope: $m = \dfrac{\text{rise}}{\text{run}}$

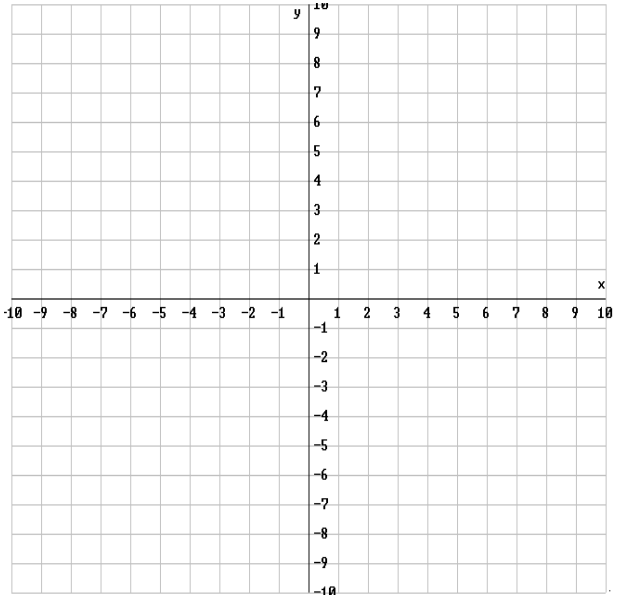
Example 5 Consider the equation $y = 3x - 5$. Use the slope and the y-intercept to graph the equation.



Linear Equations in Two Variables

Slope: $m = \dfrac{\text{rise}}{\text{run}}$

Example 6 Consider the equation $y = \dfrac{-1}{4}x - 2$. Use the slope and the y-intercept to graph the equation.



Determining the Slope

Determining the Slope

A **linear equation in two variables** is an equation that describes an infinite set of ordered pairs (x, y). The graph of a linear equation is a line.

Example 1 Complete the table of ordered pairs that satisfy the linear equation $5x + 2y = 6$.

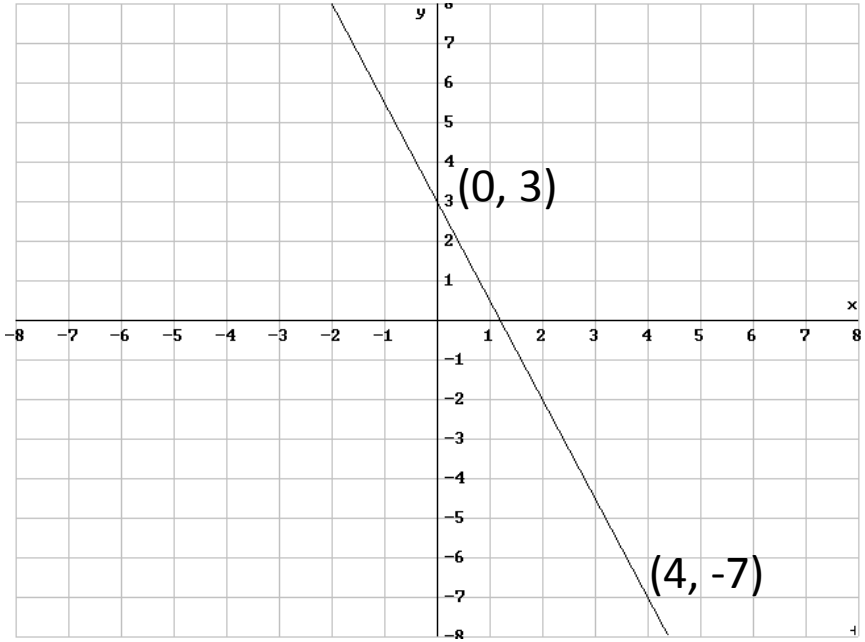
x	y
0	
	-7
1	

Determining the Slope

Given two points (x_1, y_1) and (x_2, y_2) on a line, the slope, m, of the line is:

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 2 The graph of $5x + 2y = 6$ is given below. Determine the slope of the line.



Determining the Slope

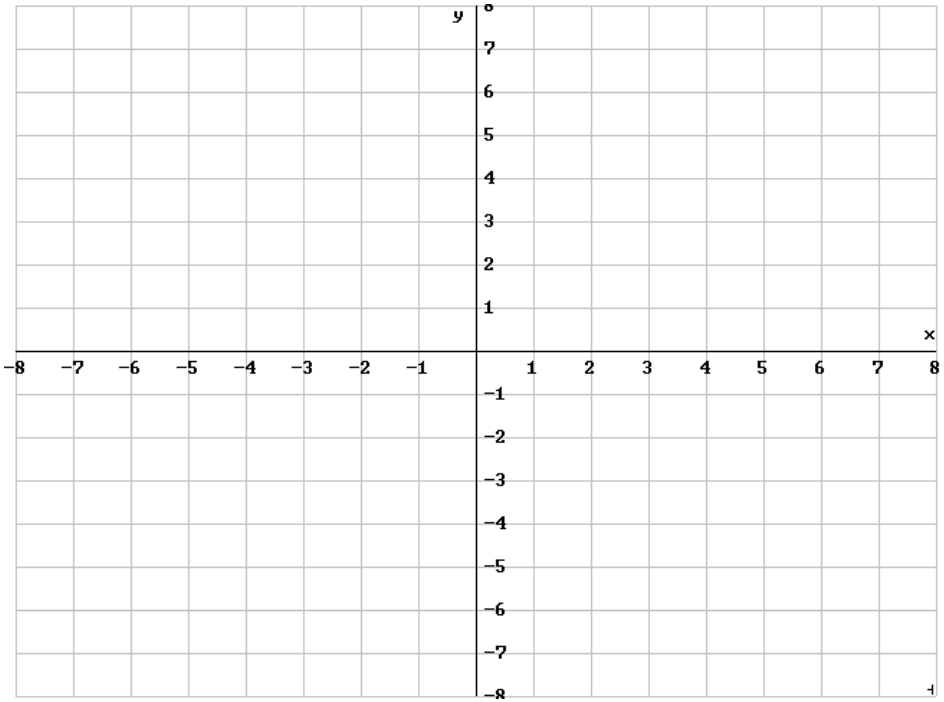
$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 3 Determine the slope of the line passing through the points (-6, -11) and (18, 17).

Determining the Slope

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

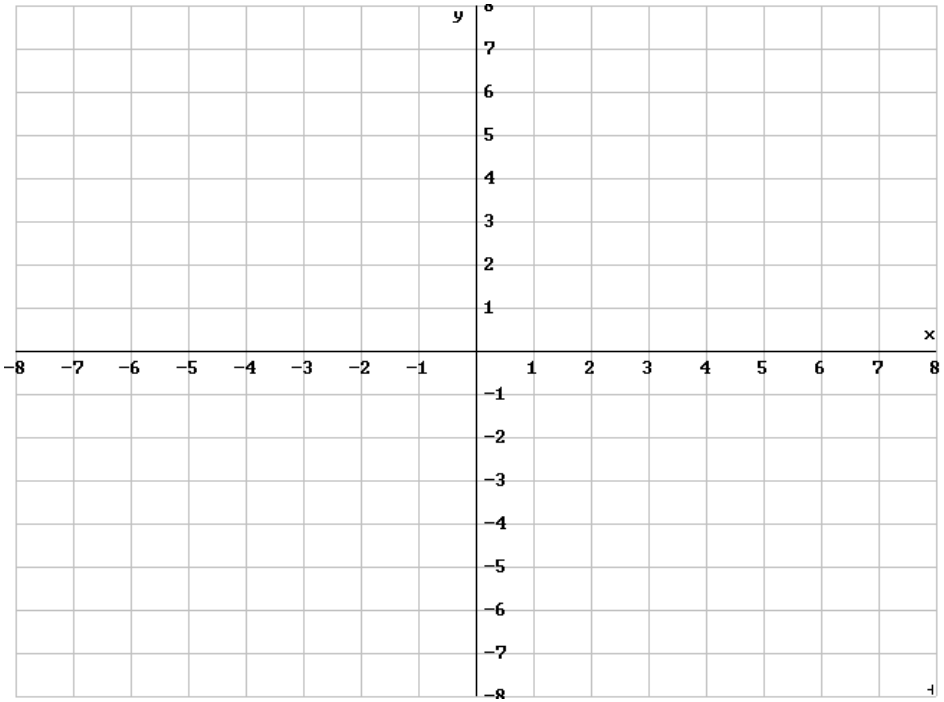
Example 4 Determine the slope of the line passing through the points (-1, -5) and (3, -5) and graph the line.



Determining the Slope

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

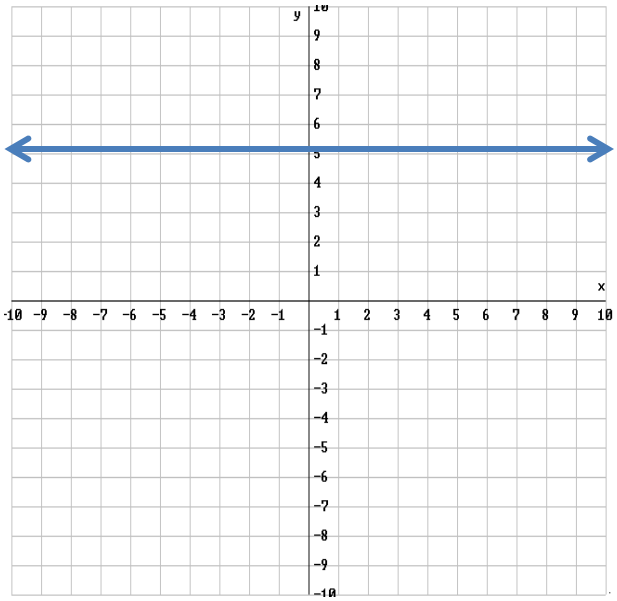
Example 5 Determine the slope of the line passing through the points (4, 0) and (4, 3) and graph the line.



Horizontal and Vertical Lines

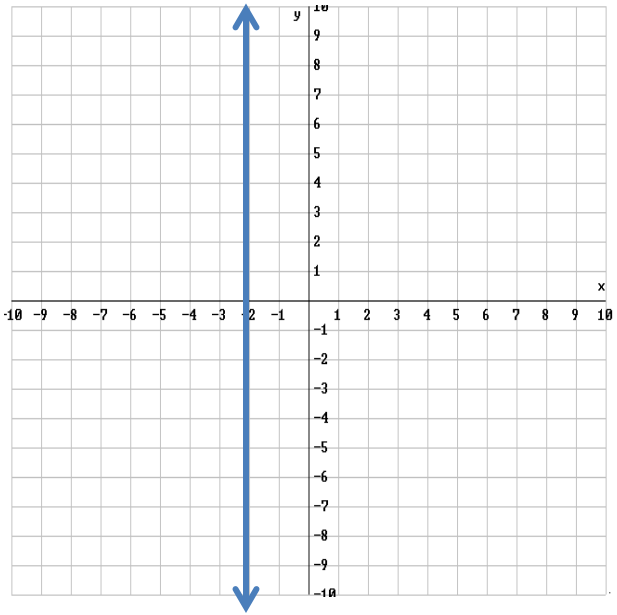
Horizontal and Vertical Lines

Example 1 Determine the equation of the line given below.



Horizontal and Vertical Lines

Example 2 Determine the equation of the line given below.

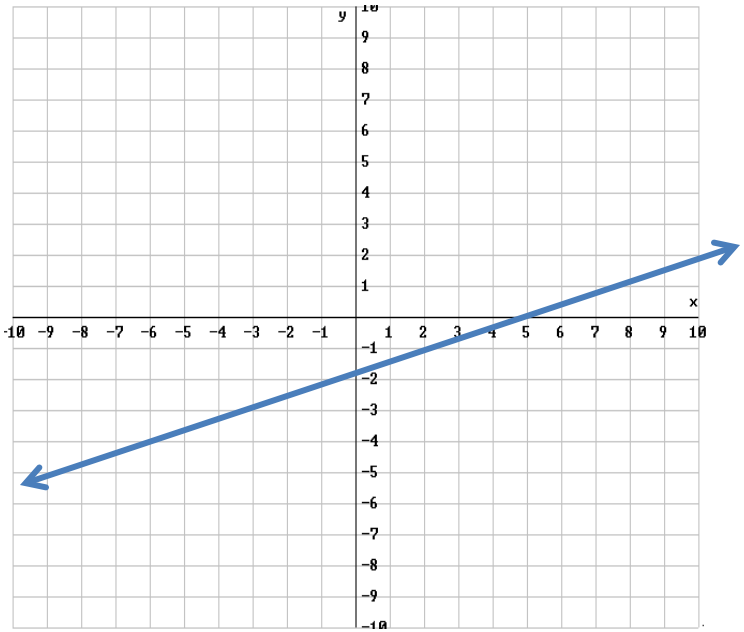


Intercepts

Intercepts

y-intercept: the point where a graph crosses the y-axis
x-intercept: the point where a graph crosses the x-axis

Example 1 Determine the x- and y-intercepts of the given graph.



Intercepts

Example 2 Determine the x- and y-intercepts of the graph of the line $y = -4x - 12$.

The x-intercept occurs at $x = \boxed{}$.

The y-intercept occurs at $y = \boxed{}$.

Intercepts

Example 3 Determine the x- and y-intercepts of the graph of the line $x = 6y + 8$.

The x-intercept occurs at $x = \boxed{}$.

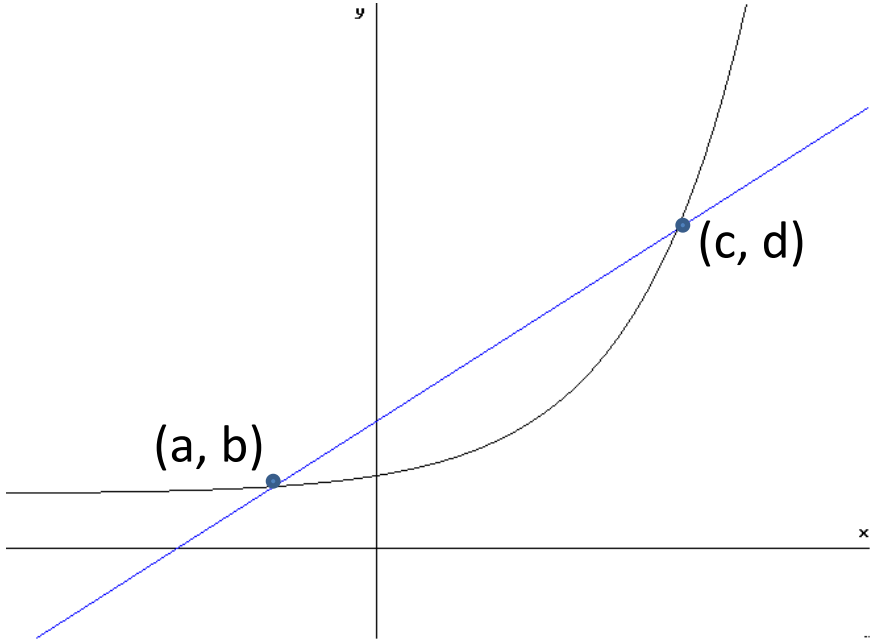
The y-intercept occurs at $y = \boxed{}$.

Exponential Equations

Interpreting Graphs

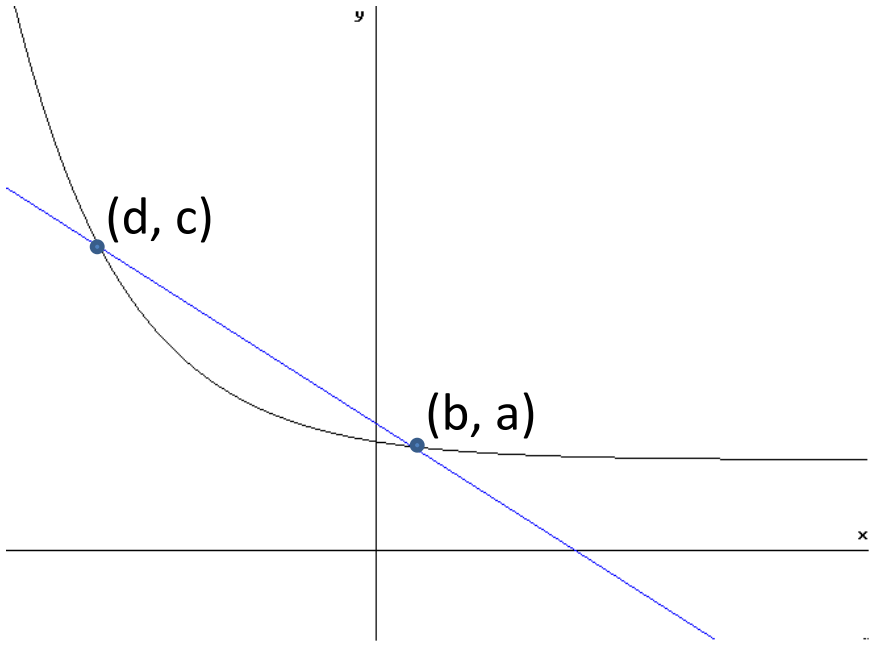
Interpreting Graphs

Example 1 Over what interval of x is the graph of the line **above** the graph of the exponential curve? *Express final answer as an open interval.*



Interpreting Graphs

Example 2 Over what interval of x is the graph of the line **below** the graph of the exponential curve? *Express final answer as an open interval.*



Exponential Equations

Properties of exponents: $a^0 = 1, a \neq 0$ and $a^{-m} = \frac{1}{a^m}$

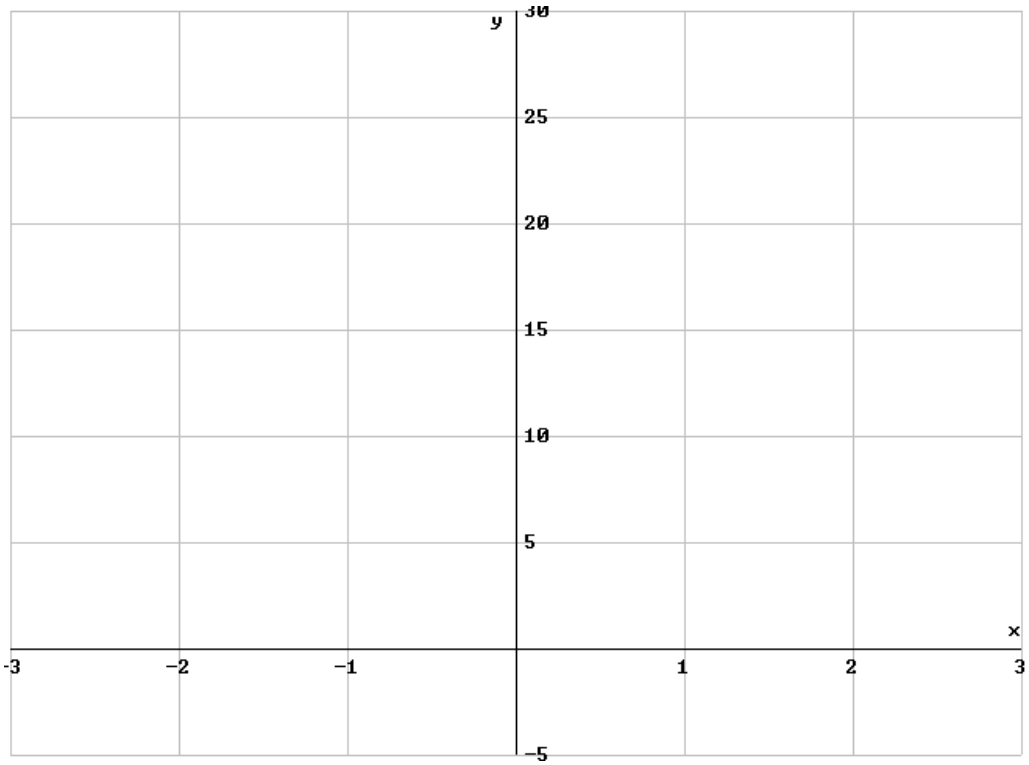
Example 1 Complete the table of ordered pairs that satisfy the exponential equation $y = 5^x$.

x	$y = 5^x$
-1	
0	
1	
2	

Exponential Equations

Example 2 Graph the exponential equation $y = 5^x$.

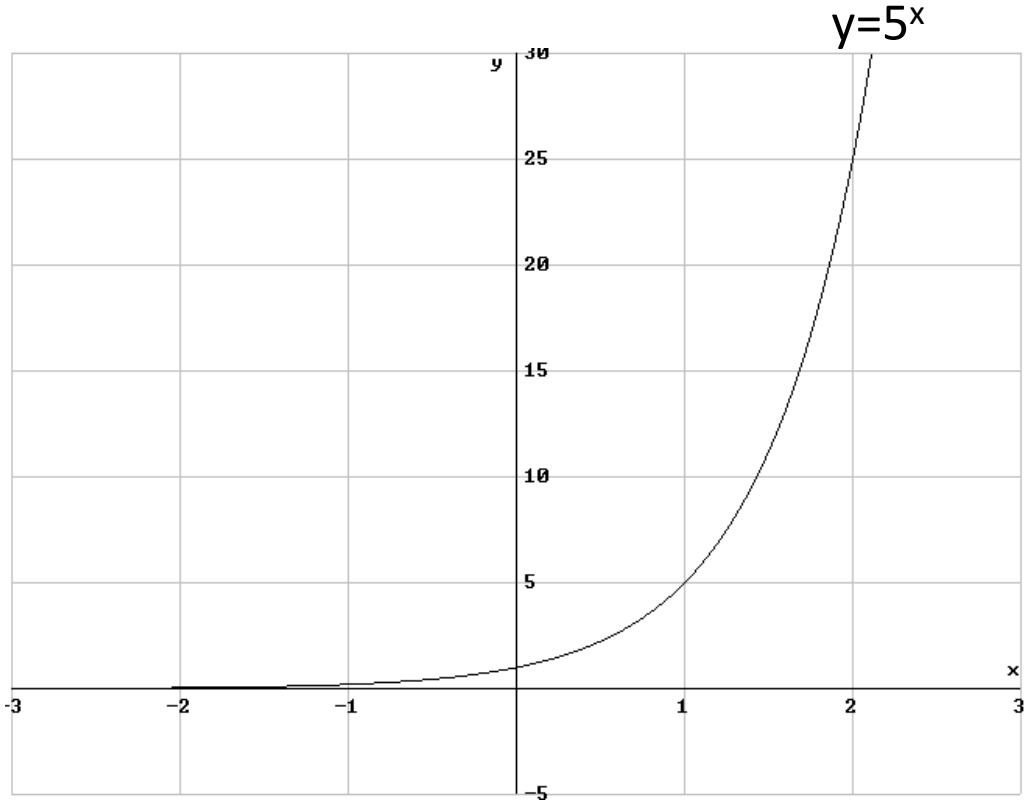
x	$y = 5^x$
-1	$\frac{1}{5}$
0	1
1	5
2	25



Exponential Equations

Example 3 Graph the exponential equation $y = 3^x$.

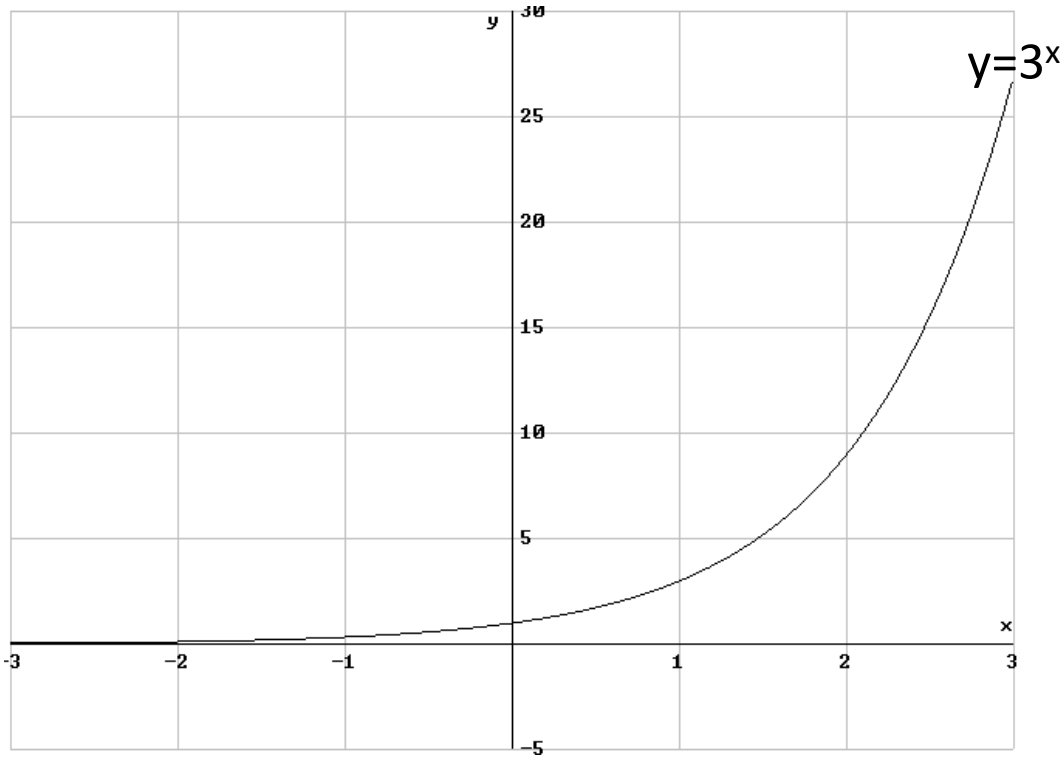
x	$y = 3^x$
-1	
0	
1	
2	



Exponential Equations

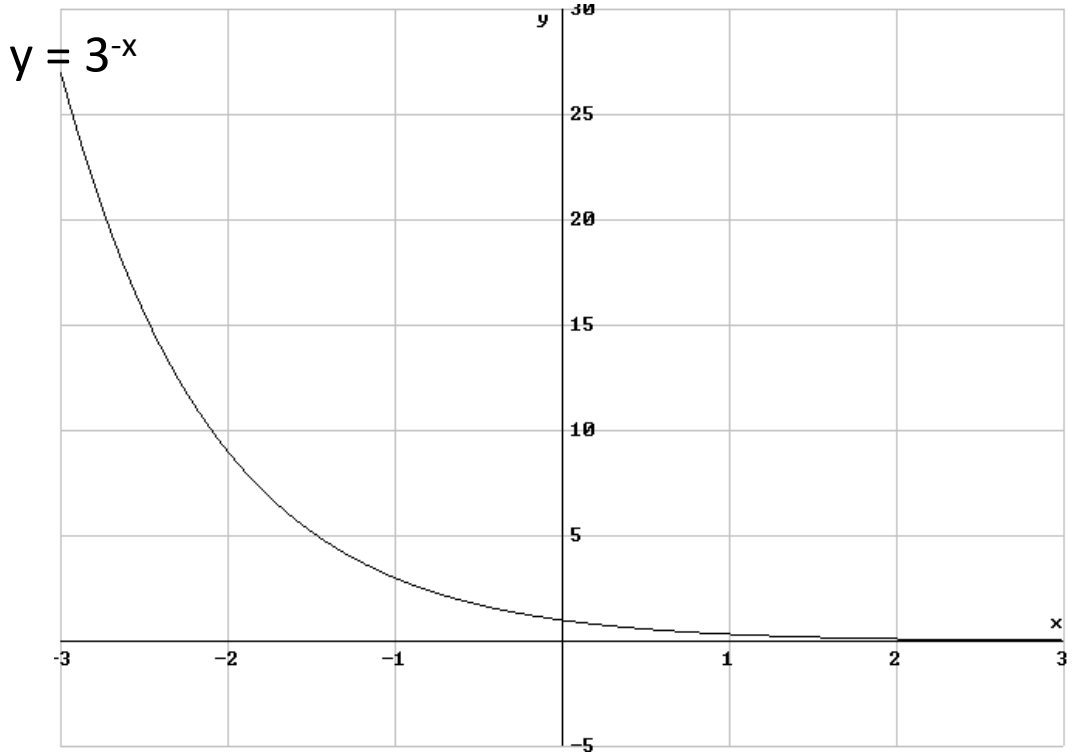
Example 4 Graph the exponential equation $y = 3^{-x}$.

x	$y = 3^{-x}$
-2	
-1	
0	
1	



Exponential Equations

Property of exponents: $\left(\frac{1}{a}\right)^{-m} = a^{m}$

Example 5 Graph the exponential equation $y = \left(\frac{1}{3}\right)^{x}$.

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