Section 3.3

Integration: Algebra
Slopes of Lines

Objective To find the slopes of lines, and
To use slope to identify parallel and perpendicular lines.

Definition of Slope The slope m of a line containing two points with coordinates (x_1, y_1) and (x_2, y_2) is given by the formula

$m = \frac{y_2 - y_1}{x_2 - x_1}$, where $x_1 \neq x_2$ also $m = \frac{rise}{run}$.

The slope of a **vertical line**, where $x_1 = x_2$, is **undefined**.

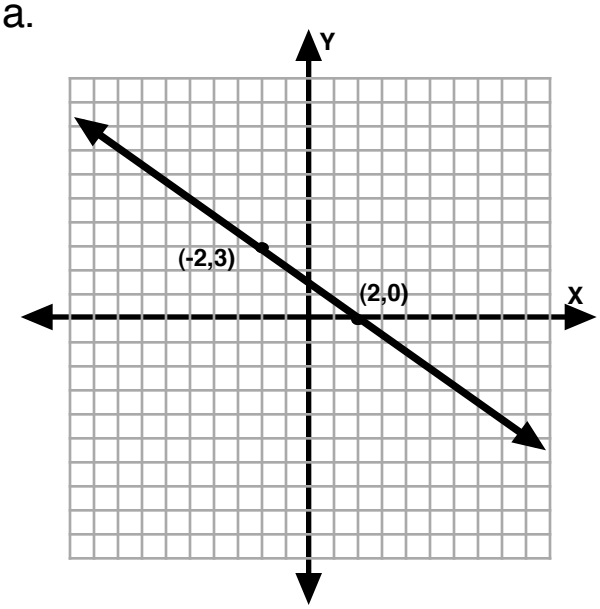
Postulate Two nonvertical lines have the same slope if and only if they are parallel.

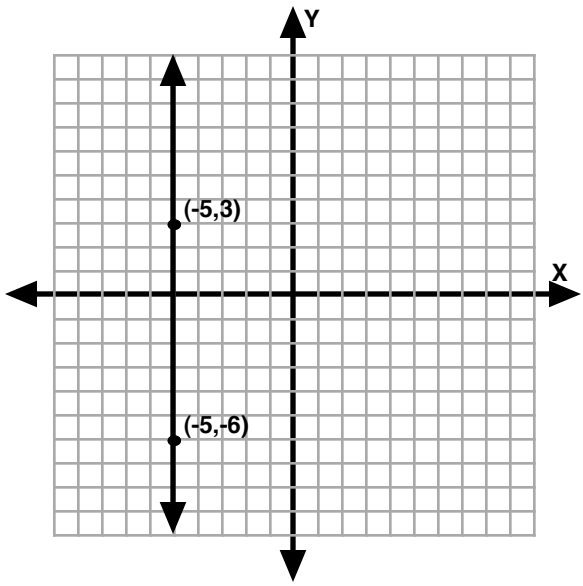
Postulate Two nonvertical lines are perpendicular if and only if the product of their slopes is -1.

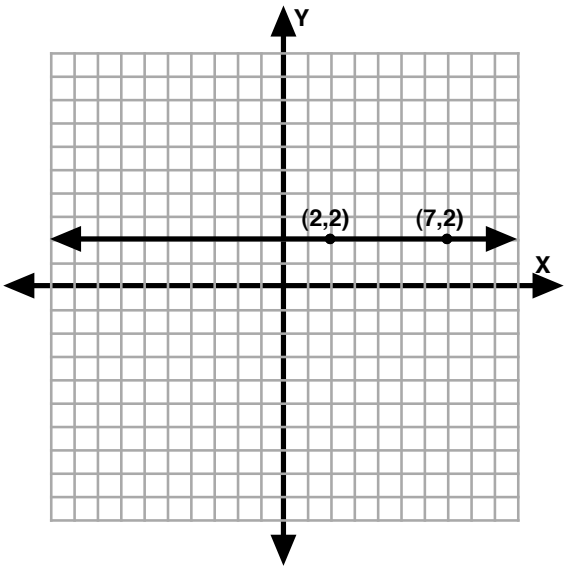
If and only if If both a conditional and its converse are true, it can be written in *if and only if* form. Also known as a **biconditional statement.**

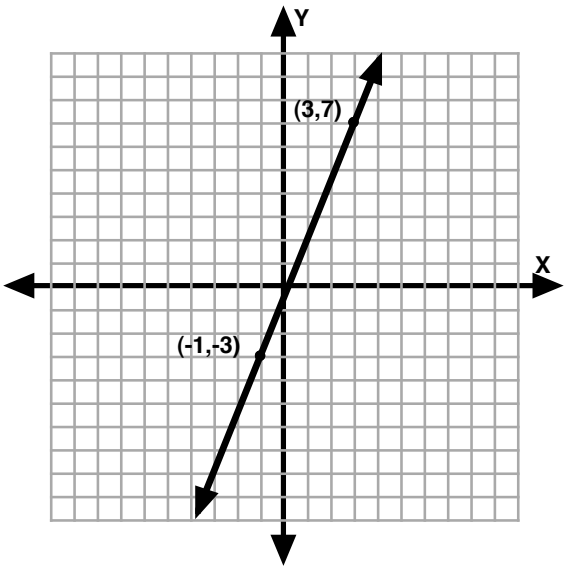
Slope **Positive** slope rises from left to right
Negative slope falls from left to right
Lines with a slope of **0** are **horizontal**
Lines with an **undefined** slope are **vertical**

Example 1
Find the slope of each line.
a.



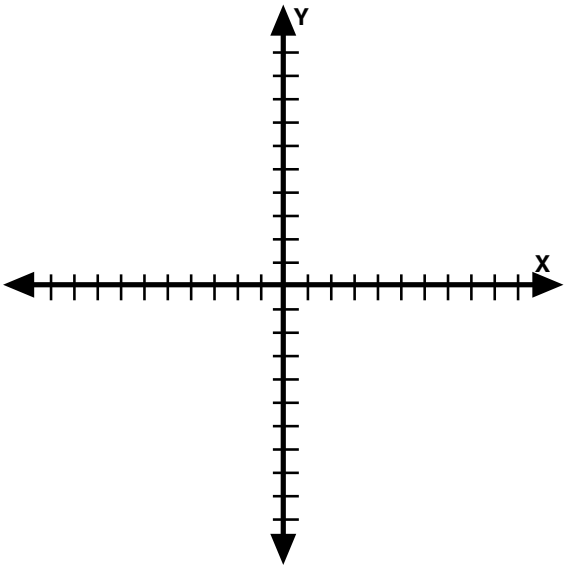






Example 2
Given $P(-2,2)$, $Q(2,1)$, $R(1,-1)$, and $S(5,-2)$, determine if $\overline{PQ}$ is parallel to or perpendicular to $\overline{RS}$.

Example 3
Draw the segment with endpoints $A(0,1)$ and $B(5,-2)$. Then draw a segment with endpoint $C(0,4)$, parallel to $\overline{AB}$ and in the first quadrant only.



Example 4
Find the value of x so the line that passes through $(x,2)$ and $(3,5)$ is perpendicular to the line that passes through $(0,1)$ and $(2,7)$.