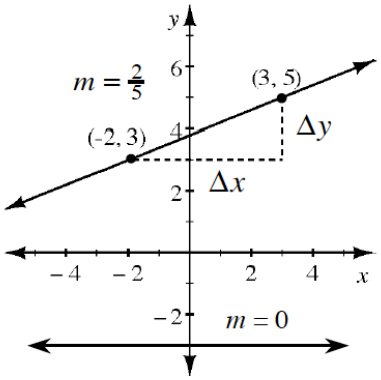
METHODS AND MEANINGS

MATH NOTES

The Slope of a Line

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\Delta y}{\Delta x}$$



The **slope** of a line is the ratio of the vertical distance to the horizontal distance of a slope triangle formed by two points on a line. The vertical part of the triangle is called y (Δy) (read "change in y"), while the horizontal part of the triangle is called x (Δx) (read "change in x"). It indicates both how steep the line is and its direction, upward or downward, left to right.

Note that "Δ" is the Greek letter "delta" that is often used to represent a difference or a change.

Note that lines pointing upward from left to right have positive slope, while lines pointing downward from left to right have negative slope. A horizontal line has zero slope, while a vertical line has undefined slope.

To calculate the slope of a line, pick two points on the line, draw a slope triangle (as shown in the example above), determine Δy and Δx, and then write the slope ratio. You can verify that your slope correctly resulted in a negative or positive value based on its direction. In the example above, $\Delta y = 2$ and $\Delta x = 5$, so the slope is $\frac{2}{5}$.

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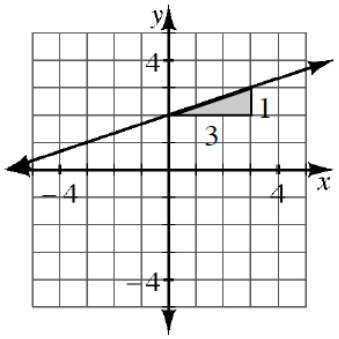
Writing the Equation of a Line from a Graph

One of the ways to write the equation of a line directly from a graph is to find the slope of the line (m) and the y-intercept (b). These values can then be substituted into the general slope-intercept form of a line: $y = mx + b$.



For example, the slope of the line at right is $m = \frac{1}{3}$, while the y-intercept is (0, 2). By substituting $m = \frac{1}{3}$ and $b = 2$ into $y = mx + b$, the equation of the line is:

$$y = mx + b \rightarrow y = \tfrac{1}{3}x + 2$$

slope y-intercept

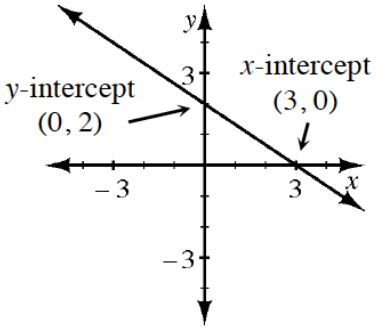
METHODS AND MEANINGS

MATH NOTES

x- and *y*-Intercepts

Recall that the ***x*-intercept** of a line is the point where the graph crosses the *x*-axis (where $y = 0$). To find the *x*-intercept, substitute 0 for *y* and solve for *x*. The coordinates of the *x*-intercept are $(x, 0)$.

Similarly, the ***y*-intercept** of a line is the point where the graph crosses the *y*-axis, which happens when $x = 0$. To find the *y*-intercept, substitute 0 for *x* and solve for *y*. The coordinates of the *y*-intercept are $(0, y)$.



Example: The graph of $2x + 3y = 6$ is a line, as shown above right.

To calculate the *x*-intercept,

Let $y = 0$; $2x + 3(0) = 6$

$2x = 6$

$x = 3$

x-intercept: (3, 0)

To calculate the *y*-intercept,

Let $x = 0$: $2(0) + 3y = 6$

$3y = 6$

$y = 2$

y-intercept: (0, 2)