Slope-Intercept Form of a Line

Recap
Graph the line \( y = -2x + 4 \).

The equation of the line is in slope-intercept form, with a slope of \(-2\) and a \(y\)-intercept of \(4\).

Beginning at \((0, 4)\), count down two units, then right one unit to reach \((1, 2)\).
Repeat this action to move to \((2, 0)\), or additional points as needed.
All points can be connected using a straight line.

Standard Form of a Line

An alternative to slope-intercept form is standard form.

Example
Convert \(3x + 5y = 10\) to slope-intercept form.

Slope-intercept form is \(y = mx + b\), so we need to isolate \(y\).

\[
3x + 5y = 10 \\
5y = -3x + 10 \\
y = -\frac{3}{5}x + \frac{10}{5}
\]

Thus, \(3x + 5y = 10\) describes the same line as \(y = -\frac{3}{5}x + 2\).

Standard Form of a Line

An alternative to slope-intercept form is standard form.

Example
Graph the line \(2x - 3y = 9\).

Begin by converting the equation to slope-intercept form.

\[
2x - 3y = 9 \\
-3y = -2x + 9 \\
y = \frac{2}{3}x - 3
\]

The line has a slope of \(\frac{2}{3}\) and a \(y\)-intercept of \(-3\).
Standard Form of a Line

A graph of $2x - 3y = 9$, or $y = \frac{2}{3}x - 3$, is below.

Example

Express $y = -\frac{1}{2}x + 2$ in standard form.

Standard form is $Ax + By = C$, so we want to gather the $x$ and $y$ terms on one side of the equation, and eliminate any fractional values.

$$y = -\frac{1}{2}x + 2$$
$$4(y) = 4(-\frac{1}{2}x + 2)$$
$$4y = -3x + 8$$
$$3x + 4y = 8$$

Therefore, $-\frac{1}{2}x + 2$ is $3x + 4y = 8$ in standard form, sometimes expressed as $3x + 4y - 8 = 0$.

Example

A street vendor sells fries for $2 and hotdogs for $4. The graph shown below has the equation $2f + 4h = 20$. Interpret this equation, and the graph of the relation itself.

In the equation, $h$ represents the number of hotdogs purchased and $f$ the number of fries.

The equation, $2f + 4h = 20$, represents all $20$ purchases that can be made. Each point on the line corresponds to a specific purchase.

For example, a customer may buy no fries and five hotdogs, corresponding to the point $(0, 5)$. $2(0) + 4(5) = 20$.

Or, he/she may buy ten fries and no hotdogs, corresponding to $(10, 0)$. $2(10) + 4(0) = 20$.

Or, he/she may buy four fries and three hotdogs, corresponding to $(4, 3)$. $2(4) + 4(3) = 20$.

In all cases, the total money spent is $20$.

Questions?