When asked to find the equation of a line you will be given some data, either a point and slope, two points, or an equation where you must first find the slope and a point.

Memorize the following formulas to be successful.

\[ y - y_1 = m(x - x_1) \]

\[ y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) \]
Ex 1) Find the equation of the line in standard form if the line passes through the point \((-8, 3)\) and has a slope of \(\frac{3}{4}\).

\[
y - 3 = \frac{3}{4}(x + 8)
\]

\[
y - 3 = \frac{3}{4}x + 6
\]

\[
y = \frac{3}{4}x + 9 \quad (\text{slope-intercept form})
\]

\[
4 \left[ y = \frac{3}{4}x + 9 \right]
\]

\[
4y = 3x + 36
\]

\[
-3x + 4y = 36
\]

\[
3x - 4y = -36 \quad \text{Standard Form}
\]
Ex 2) Find the equation of the line in slope intercept form that passes through the points \((1, 2)\) and \((3, 6)\).

\[
y - 2 = \frac{6 - 2}{3 - 1} (x - 1)
\]

\[
y - 2 = \frac{4}{2} (x - 1)
\]

\[
y - 2 = 2x - 2
\]

\[
y = 2x + 0
\]

Ex 3) Find the equation of the line in slope intercept form that has a slope of \(-3\) and \(y\)-intercept of 2.

Reminder: Slope Intercept Form is \(y = mx + b\)

\[
y = -3x + 2
\]

Geometry Reminder:

1) Parallel lines have the same slope.
2) Perpendicular lines have slopes that are opposite \textbf{and} reciprocals of each other (their products = \(-1\)).
Ex 4) Find the equation of the line containing the point (-1, 3) that is parallel to the line $2x + y = 10$.

\[ m = -2 \quad (y = -2x + 10) \text{ same slope} \]

\[ y - 3 = -2(x + 1) \]

\[ y - 3 = -2x - 2 \]

\[ y = -2x + 1 \]
Ex 5) Find the equation of the line containing the point (2, -3) that is perpendicular to $4y - x = 20$.

\[
4y - x = 20
\]
\[
4y = x + 20
\]
\[
y = \frac{1}{4}x + 5
\]

The slope is $\frac{1}{4}$.

The opposite and reciprocal is: $m = -4$

\[
y + 3 = -4(x - 2)
\]
\[
y + 3 = -4x + 8
\]
\[
y = -4x + 5
\]