Math 006: Equations of Lines

1. Find the slope of the line through the points \((-4, 2)\) and \((2, -6)\).

**Answer:** \(m = \frac{-6 - 2}{2 - (-4)} = \frac{-8}{6} = -\frac{4}{3}\). The slope is \(\frac{4}{3}\).

2. Use the point-slope form a line to find the equation of line with slope 3 that goes through the point \((-2, -4)\).

**Answer:** We use the equation \(y - y_1 = m(x - x_1)\) and so \(y - (-4) = 3(x - (-2))\), or \(y + 4 = 3(x + 2)\) or \(y + 4 = 3x + 6\) and so \(y = 3x + 2\).

3. Find the equation of the line through the points \((2, 5)\) and \((-1, -4)\).

**Answer:** First find the slope of the line through the two points: \(m = \frac{-4 - 5}{-1 - 2} = \frac{-9}{-3} = 3\).

You can continue as in the previous problem since the line goes through the point \((2, 5)\) and has slope 3, we know \(y - 5 = 3(x - 2)\) or \(y - 5 = 3x - 6\) and so the slope-intercept form of the line is \(y = 3x - 1\).

Another way to finish the problem once you know the slope is 3, plug in one of the points, say \((2, 5)\) into \(y = 3x + b\). Then \(5 = 3(2) + b\), so \(5 = 6 + b\), and so \(b = -1\). Therefore, \(y = 3x - 1\) is the slope intercept-form of the equation of the line.

To check your answer, see if the points \((2, 5)\) and \((-1, -4)\) are on the line \(y = 3x - 1\).

4. Graph the lines by plotting points: (a) \(y = 2x + 1\); (b) \(y = -3x + 5\); (c) \(y = \frac{1}{2}x + 2\)

**Answer:** See the Kahn academy video [Algebra: Graphing linear equations](#).

5. (a) Find the slope of the line through the points \((-1, 3)\) and \((2, 1)\).

(b) Find the slope of the line through the points \((5, 2)\) and \((3, 5)\).

(c) Find the slope of the line through the points \((1, 2)\) and \((4, 3)\).

**Answer:** See the Kahn academy video [Algebra: Slope](#).

6. (a) Find the equation of the line through the points \((2, 5)\) and \((-3, -3)\)

(b) Find the equation of the line through the points \((2, -3)\) and \((-4, 5)\)

(c) Find the equation of the line through the points \((-8, 5)\) and \((2, 0)\)

**Answer:** See the Kahn academy videos [Algebra: Slope 2](#) and [Algebra: Slope 3](#).

7. (a) Find the equation of the line through the points \((1, 2)\) and \((3, 4)\)

(b) Find the equation of the line through the points \((-3, 5)\) and \((2, -6)\)

**Answer:** See the Kahn academy video [Algebra: Equation of a Line](#).
8. Consider the following four lines.

(i) Which line has $x$-intercept $(-2,0)$ and $y$-intercept $(0,3)$? \(\text{(c)}\)

**Note:** look for line that crosses $x$-axis at $-2$ and $y$-axis at $3$.

(ii) Write the slope-intercept form of the equation for the line graphed in (a). \(y = -\frac{3}{2}x + 3\)

**Note:** The line crosses the $y$-axis at $3$, so $b = 3$ and the line goes *down* $3$ units for every $2$ units moved to the right, so the slope is \(m = -\frac{3}{2}\).

(iii) Which, if any, of the lines has slope \(m = \frac{3}{2}\)? \(\text{(b) and (c)}\)

**Note:** Look for the lines that go *up* $3$ units for every $2$ units moved the the right.
(iv) Which, if any, of the lines has slope \( m = -\frac{2}{3} \)?  
\[ \text{None} \]

\textbf{Note:} None of the lines go \textit{down} 2 units for every 3 units moved to the right.

(v) Which, if any, of the lines has equation \(-2x + 3y = 6\)?  
\[ \text{None} \]

\textbf{Note:} Look for a line that crosses \( x \)-axis at \(-3\) and \( y \) axis at 2. Alternatively, write in slope-intercept form by solving for \( y \) and find: \( y = \frac{2}{3}x + 2 \) and note that none of the lines have slope \( \frac{2}{3} \) and \( y \)-intercept \((0, 2)\).

(vi) Which, if any, of the lines has equation \( 3x - 2y = 6 \)?  
\[ \text{(b)} \]

\textbf{Note:} The line must cross \( x \)-axis when \( x = 2 \) and \( y \)-axis when \( y = -3 \). Alternatively, write in slope-intercept form by solving for \( y \) and find: \( y = \frac{3}{2}x - 3 \) and look for the line with slope of \( \frac{3}{2} \) and \( y \)-intercept \((0, -3)\).

(vii) For the line in (d) find: the \( x \)-intercept \((-2, 0)\) and the \( y \)-intercept \((0, -3)\)  

\textbf{Note:} the graph crosses the \( x \)-axis when \( x = -2 \), and the \( y \)-axis when \( y = -3 \).