Definitions:
- **Slope**: of a line tells how fast \( y \) changes for each unit of change in \( x \).
- **Linear equation in two variables**: is an equation that can be written as
  \[
  ax + by = c
  \]
  where \( a, b, \) and \( c \) are real numbers and \( a \) and \( b \) cannot both be zero.

Important Formulas:
- **Slope formula**: The slope of the line through the points \((x_1, y_1)\) and \((x_2, y_2)\) is given by
  \[
  m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}
  \]
  Note that it does not matter if you start with \( y_1 \) or \( y_2 \). However, you must start with its corresponding \( x \) in the denominator.

- **Slope-intercept form**: The slope-intercept form of an equation with slope \( m \) and \( y \)-intercept \( b \) is given by
  \[
  y = mx + b
  \]

- **Point-slope formula**: The equation of the line with slope \( m \) and passing through \((x_1, y_1)\) can be found using
  \[
  y - y_1 = m(x - x_1)
  \]

Common Mistakes to Avoid:
- When identifying the slope and \( y \)-intercept using the slope-intercept form, remember to divide each term by the coefficient on \( y \). The slope and \( y \)-intercept can only be identified once you have isolated \( y \).
- Remember that the change in \( y \) is in the numerator of the slope formula. DO NOT place it in the denominator.
PROBLEMS

1. Identify the slope and the \( y \)-intercept of each line.

(a) \( 3x - 2y = 6 \)

\[
\begin{align*}
3x - 2y &= 6 \\
-2y &= -3x + 6 \\
y &= \frac{3}{2}x - 3
\end{align*}
\]

\[
m = \frac{3}{2}
\]

\[
y - \text{intercept} = (0, -3)
\]

(b) \( 5x + 10y = -3 \)

\[
\begin{align*}
5x + 10y &= -3 \\
10y &= -5x - 3 \\
y &= \frac{-5}{10}x - \frac{3}{10} \\
y &= -\frac{1}{2}x - \frac{3}{10}
\end{align*}
\]

\[
m = -\frac{1}{2}
\]

\[
y - \text{intercept} = \left(0, -\frac{3}{10}\right)
\]

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

\[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
m = \frac{-2 - 3}{5 - (-1)}
\]

\[
m = \frac{-5}{6}
\]

\[
m = \frac{5}{6}
\]

3. Find the slope of the line passing through \((-9, 2)\) and \((-5, 5)\).

\[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
m = \frac{5 - 2}{-5 - (-9)}
\]

\[
m = \frac{3}{4}
\]

\[
m = \frac{3}{4}
\]

4. Find the equation of the line with slope \( m = -3 \) and passes through \((5, -2)\).

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

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

\[
y + 2 = -3x + 15
\]

\[
y = -3x + 13
\]
5. Find the equation of the line with \( m = \frac{3}{4} \) and passing through \((-1,2)\).

\[
y - y_1 = m(x - x_1)
\]
\[
y - 2 = \frac{3}{4}(x - (-1))
\]
\[
y - 2 = \frac{3}{4}x + \frac{3}{4}
\]
\[
y = \frac{3}{4}x + 11\frac{1}{4}
\]

7. Find the equation of the line passing through \((-7,2)\) and has a \(y\)-intercept at 3.

NOTE: First, we must find the slope of the line. Remember that a \(y\)-intercept at 3 translates to the ordered pair \((0,3)\).

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 3}{-7 - 0} = \frac{-1}{-7} = \frac{1}{7}
\]
\[
y = mx + b
\]
\[
y = \frac{1}{7}x + 3
\]

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

NOTE: First, we must find the slope of the line.

\[
m = \frac{-5 - 3}{4 - (-2)} = \frac{-8}{6} = \frac{-4}{3}
\]

\[
y - y_1 = m(x - x_1)
\]
\[
y - 3 = \frac{-4}{3}(x - (-2))
\]
\[
y - 3 = \frac{-4}{3}x - \frac{8}{3}
\]
\[
y = \frac{4}{3}x + 1\frac{1}{3}
\]

8. Find the equation of the line which has an \(x\)-intercept at \(-2\) and a \(y\)-intercept at 4.

NOTE: This means that the line passes through \((-2,0)\) and \((0,4)\).

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - (-2)} = \frac{4}{2} = 2
\]
\[
y = mx + b
\]
\[
y = 2x + 4
\]

9. Find the equation of the line passing through \((-7,2)\) and has an \(x\)-intercept at 3.

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 0}{-7 - 3} = \frac{2}{-10} = \frac{-1}{5}
\]
\[
y - 0 = \frac{-1}{5}(x - 3)
\]
\[
y = \frac{-1}{5}x + 3\frac{3}{5}
\]