WRITE THE EQUATION OF A LINE

Formulas
Slope formula: \( m = \frac{y_2 - y_1}{x_2 - x_1} \)
Slope-intercept form: \( y = mx + b \)
Point-slope form \( y - y_1 = m(x - x_1) \)

1. Given: Slope (m) and the y-intercept (0, b)
   Use: Slope-intercept form: \( y = mx + b \)

   Example: Write the equation of a line with a slope of 5 and a y-intercept of (0, -7).
   Since \( m = 5 \) and (0, -7) is the y-intercept, \( b = -7 \), then substituting into the form \( y = mx + b \) will give us the equation of the line:
   \( y = 5x - 7 \)

2. Given: Slope (m) and point \((x_1, y_1)\)
   Use: Point-slope form: \( y - y_1 = m(x - x_1) \)

   Example: Write the equation of a line in slope-intercept form, with a slope of -3 and goes through the point (3, -2).
   Since \( m = -3 \) and (3, -2) is the point \((x_1, y_1)\), substitute into the form
   \[
   y - y_1 = m(x - x_1) \\
   y - (-2) = -3(x - 3) \\
   y + 2 = -3x + 9 \\
   y = -3x + 7
   \]

3. Given: Two points \((x_1, y_1)\) and \((x_2, y_2)\)
   Use:
   a. \( m = \frac{y_2 - y_1}{x_2 - x_1} \)
   b. Pick one of the two points and use point-slope form

   Example: Write the equation of a line in slope-intercept form that goes through the two points (-1, 4) and (2, -2).
   a. \( m = \frac{-2 - 4}{2 - (-1)} = \frac{-6}{3} = -2 \)
   b. \( m = -2 \), using point (-1, 4)
      \[
      y - 4 = -2(x - (-1)) \\
      y - 4 = -2(x + 1) \\
      y - 4 = -2x - 2 \\
      y = -2x + 2
      \]

4. Given: An equation of a line with a parallel or perpendicular relationship and a point \((x_1, y_1)\).
   Use: The given equation of a line and the relationship to find the slope. (Parallel use the same slope, perpendicular use the opposite-reciprocal slope). Then use point-slope form.

   Example: Write the equation of a line in slope-intercept form that is perpendicular to \(2x - 3y = 6\) and goes through the point (-1, 2).
   a. Solve the given equation for \( y \) to identify the slope.
      \[
      2x - 3y = 6 \\
      -3y = -2x + 6 \\
      y = \frac{2}{3}x - 2, \quad m = \frac{2}{3}
      \]
   b. Use \( m = \frac{-3}{2} \) because it is the perpendicular slope to \(2x - 3y = 6\), and point (-1, 2).
      \[
      y - 2 = \frac{-3}{2}(x + 1) \\
      y - 2 = \frac{-3}{2}x - \frac{3}{2} \\
      y = -\frac{3}{2}x + \frac{1}{2}
      \]