The Use of Point-Slope Formula

**Part I)**

Introduction of the different formulas:

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2-Point Form [ y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} ]</td>
</tr>
<tr>
<td>2</td>
<td>Point-Slope Form [ y - y_1 = m(x - x_1) ]</td>
</tr>
<tr>
<td>3</td>
<td>Y-Intercept Form [ y = mx + b ]</td>
</tr>
</tbody>
</table>

\(m = \text{slope}\)

\(b = \text{y-intercept}\)

**Part II)**

**Eg. 1)** (When given two points): Find the equation of a line that goes through the points (4,2) and (-2,-1):

First, we find the slope:

\[m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 2}{-2 - 4} = \frac{1}{2}\]

Then, we choose a set of points, let’s say (4,2), and substitute the slope and the points into the point-slope form, as follow:

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

**Eg.2)** (When the slope and a point): Find the equation of a line that the slope is -1 and it passes through the point (3,1):

In this case, we simply substitute the given information into the formula, as follow:

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

**Eg.3)** (When the y-intercept and the slope): Find the equation of a line that the y-intercept is -1 and the slope is 2.
First, we find the coordinate for the y-intercept. We know that the “x” is always zero for the y-intercept, so, our coordinate will be: (0,-1). We have our slope, which is 2. Now, we simply substitute into the formula, as follow:

\[ y - (-1) = 2(x - 0) \]
\[ y + 1 = 2x \]

Eg.4) (We are given the slope and the x-intercept): Find the equation of a line that the x-intercept is 2 and the slope is 5.

This case is very similar to the previous one, but instead of the y-intercept, we now have the x-intercept. We then find its coordinate. We know that the “y” is always zero for the x-intercept, so the coordinate will be (2,0). Our slope is 5. We now simply substitute the information into the formula:

\[ y - 0 = 5(x - 2) \]
\[ y = 5(x - 2) \]

Part III) How to write a line equation in Standard Form: \( Ax + By = C \)

Eg.) Transform the equation \( y - 2 = \frac{1}{2}(x - 4) \) into Standard Form.

1) Distribute;
   \[ y - 2 = (1/2)x - 2 \]

2) Move the variables to one side and leave the constant “C” to the other side;
   \[-(1/2)x + y = 0 \]

3) Simplify;
   N/A in this example

4) Make the “A” and “B” terms positive and integers;
   Multiply the equation by \(-2\) to make it positive and integers → \( x - 2y = 0 \)