2.1 Linear Functions

• **Slope** of the line between the points \((x_1, y_1)\) and \((x_2, y_2)\) is

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

• We may also describe slope as the **Rate of Change** of \(y\) with respect to \(x\).

• **Point-Slope** equation of a line: with slope \(m\) passing through the point \((x_0, y_0)\)

\[
y - y_0 = m(x - x_0)
\]

• **Slope-Intercept** equation of a line with slope \(m\) and \(y\)-intercept \((0, b)\)

\[
y = mx + b
\]

1. Find an equation of the line between the points \((-2, 0)\) and \((\frac{1}{2}, 3)\).

2. Let \(f(x) = \frac{3x}{2 + x}\), find the average rate of change of \(f(x)\) over the interval \([1, 3]\)

3. Suppose the temperature at PSA at 6:00 am was \(59^\circ F\) and at 9:00 am it was \(65^\circ F\)
   
   (a) Find the slope of the line containing the points \((6, 59)\) and \((9, 65)\)
   
   (b) Interpret your answer to the first part in terms of temperature and time
   
   (c) Predict the Temperature at PSA at noon.

4. Write the equation of the line that is perpendicular to the line \(5y + 2x = 7\) and passes through the point \((\pi, \sqrt{2})\)

5. (Optional) Jackie’s Pie baking shop needed to buy $100 worth of baking supplies (rolling pins, pie plates, measuring cups, etc). If the ingredients for each pie (flour, butter, fruit) cost $4 per pie, Find a linear function \(C\) for Jackie’s total costs when making \(x\) pies.