Section 1.1: Lines

Ex. $y = 2x+1$
The graph is the set of points (x,y) in the plane for which the equation is true.

Any equation of the form $y = mx+b$ has a graph which is a non-vertical line.
For a non-vertical line the slope is:

$$\frac{Y_2 - Y_1}{X_2 - X_1}$$

for any points x_1, x_2, y_1, y_2 on the line.
Ex. $y = 2x+1$, with the points (0,1) and (1,3)

$$\text{Slope} = \frac{3-1}{1-0}$$

Slope = 2

$$\text{Slope} = m = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{(mx_2 + b) - (mx_1 + b)}{x_2 - x_1}$$

When $y = mx+b$, if $x = 0$ then $y = b$. So (0,b) is on the line and b is the y-intercept.

$$m = \frac{\Delta y}{\Delta x} \qquad \Delta y = m\Delta x$$

change in x gives proportional change in y

Ex. y = daily income of cabbie
x = # of hours cabbie works
$y = 80x - 100$ could only be true over limited domain
$\Delta y = 80\Delta x$

A mathematical model can offer great clarity over some range.
Ex. (Goldstein 1.1.52)

$$y(t) = (-25{,}000)t + 125{,}000$$

Suppose (x,y) is a point on line L and L has slope m. Then for any other point (x,y) on L:

$$m = \frac{\Delta y}{\Delta x}$$

$$y - y_1 = m(x - x_1)$$