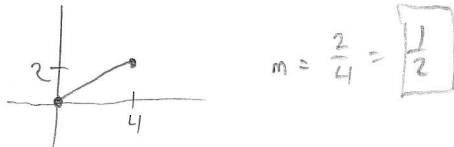


Mr. Gmerek
Calculus
Problem Set 1.1

1. Sketch a (non-horizontal, non-vertical) line and find its slope.



a. What do we know about parallel and perpendicular lines?

parallel lines have the same slope
perpendicular lines have opposite reciprocal slopes

b. What do we know about horizontal and vertical lines?

horizontal lines have $m=0$
vertical lines have undefined slope

c. Write the equations for the horizontal and vertical lines that pass through the point (7, -5).

$x=7$ (vertical)
 $y=-5$ (horizontal)

2. Point-slope - Where does $y - y_1 = m(x - x_1)$ come from?

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

a. Find the equation of the line with a slope of $-2/3$ that passes through the point (-3, 5).

$y - 5 = -\frac{2}{3}(x + 3)$ $y = -\frac{2}{3}x + 3$

b. Find the equation of the line that passes through the points $(1/2, 3/4)$ and $(8, -5)$.

$m = \frac{-5 - \frac{3}{4}}{8 - \frac{1}{2}} = \frac{-\frac{23}{4}}{\frac{15}{2}} = -\frac{23}{4} \cdot \frac{2}{15} = -\frac{23}{30}$ $y + 5 = -\frac{23}{30}(x - 8)$ $y = -\frac{23}{30}x + \frac{17}{15}$

c. Write an equation for the line through (-1, 2) that is:

i. parallel to $y = 3x - 4$.

$y - 2 = 3(x + 1)$
 $y = 3x + 5$

ii. perpendicular to $y = 3x - 4$.

$y - 2 = -\frac{1}{3}(x + 1)$
 $y = -\frac{1}{3}x + \frac{5}{3}$

3. General Linear Equation: $Ax + By = C$.

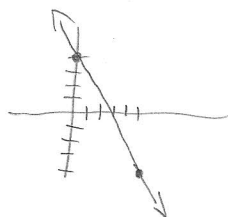
a. What must be true about the general linear equation?

A and $B \neq 0$

b. Find the slope and y-intercept of $8x + 5y = 20$ and sketch a graph.

y-int is $(0, 4)$

slope is $-\frac{8}{5}$



4. Freezing point: $F = 32^\circ$ or $C = 0^\circ$
 Boiling Points: $F = 212^\circ$ or $C = 100^\circ$

The relationship between Fahrenheit and Celsius is linear. Find the conversion equation.

$$\begin{matrix} (32, 0) \\ (212, 100) \end{matrix} \quad m = \frac{100}{180} = \frac{5}{9} \quad C - 0 = \frac{5}{9}(F - 32)$$

$$\boxed{C = \frac{5}{9}(F - 32)}$$

5. Find a regression curve for the data.

Year	Cell phones (in millions)
1990	5.3
1992	7.6
1995	11
1998	16
2000	24.1
2001	33.8
2002	44
2003	55.3
2004	69.2
2005	86
2006	109.5
2008	128.7

exponential regression

$$\boxed{y = (4.61)(1.21)^x} \quad (\text{rounded to two decimal places})$$

Realistically, this should be a logistic model. why?

- a. What types of regression curves exist?

linear, quadratic, cubic, exponential, logarithmic, etc...

- b. If the data represent the number of cell phones sold since 1990, how many projected sales will there be in 2015?

$$y = (4.61)(1.21)^{25} \quad (\text{don't use rounded numbers here!})$$

$$\boxed{y = 503.08 \text{ million!}}$$