

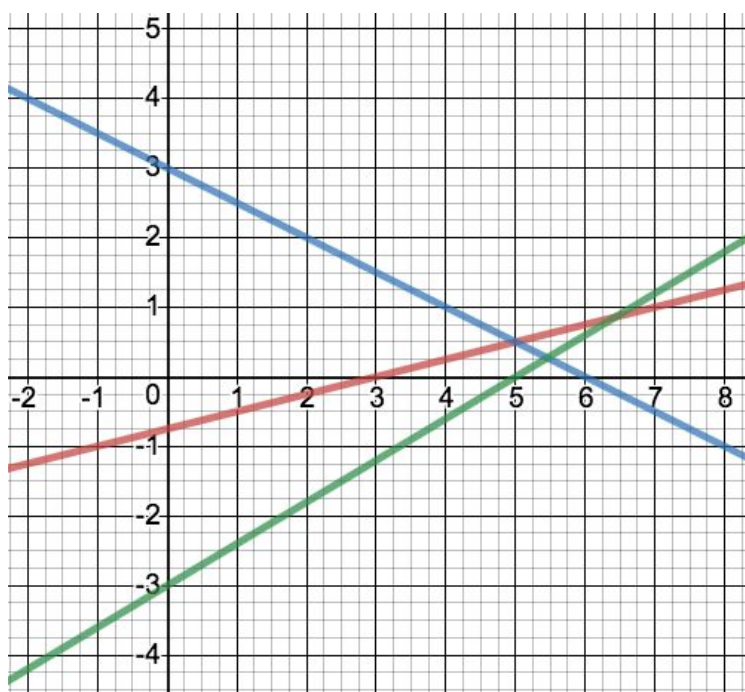
## IM2 Problem Set 4.2 - Linear Relations & Functions

BIG PICTURE  
of this UNIT:

- What is meant by the term FUNCTIONS and how do we work with them?
- mastery with working with basics & applications of linear functions
- mastery with working with basics & applications of linear systems
- understanding basics of function concepts and apply them to lines & linear systems

### Part 1 - Skills/Concepts Review

1. Determine the equation of the following lines and express each equation in standard form.
  - a. The line through the points A(1,2) and B(3,-4)
  - b. The line through the points A(3,-1) and B(7,7)
  - c. The line through the point A(5,-2) and perpendicular to  $3x - 2y - 6 = 0$ .
  - d. The line through the point A(-3,-4) and parallel to the line  $4x + 2y = -8$ .
  
2. From the following graphs, determine the equation of each line and express each linear equation in standard form as well as function form i.e.  $f(x) = mx + b$



3. The notation  $f(3) = 7$  communicates INFORMATION.
  - a. explain what the  $f$  means.
  - b. explain what the 3 means.
  - c. explain what the 7 means.
  - d. what are 2 alternative ways to communicate the same information?

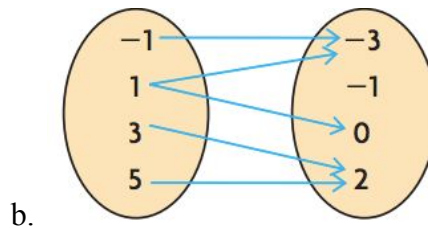
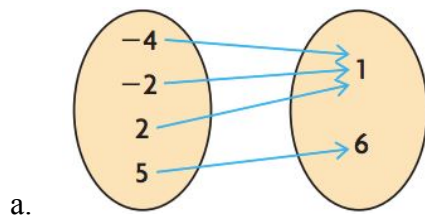
4. From the following linear equations, determine the slope and  $x$ - and  $y$ -intercepts of the lines. (If you need to convince yourself they are linear, graph them using DESMOS)

a.  $g(x) = 5 - 2x$     b.  $h(x) + 4 = -2(x + 3)$     c.  $2x - 8y - 32 = 0$     d.  $\frac{x}{2} + \frac{y}{5} = 1$

5. Evaluate the following:

a. Evaluate (i)  $f(5)$  if  $f(x) = 2x - 8$     (ii)  $f(\frac{1}{2})$  if  $f(x) = 7 + 4x$     (iii)  $g(2)$  if  $g(x) = -3 \times 2^{x+3}$   
 b. Evaluate (i)  $f(-2)$  if  $f(x) = (2x - 3)(x + 4)$     (ii)  $h(-1)$  if  $h(x) = -2(x + 3)^2 + 4$

6. For the following relations, state their domain and range and whether these relations are functions. Explain the reasoning for your choices



7. For the following relations, state their domain and range and whether these relations are functions. Explain the reasoning for your choices.

a.  $\{(-5,1), (-3,2), (-1,3), (1,2)\}$     b.  $\{(0,4), (3,5), (5,-2), (0,1)\}$

## **Part 2 - Skills/Concepts Application Problems**

8. Joe downloads music from a site that charges \$9.95 per month plus \$0.55 for each song. Joe has budgeted \$40/month to spend on music downloads.

- If Joe downloads 5 songs in January, how much of his budget has he spent?
- If Joe decides to use only \$30 in February, how many songs can he download?
- Determine the maximum number of songs that Joe can download per month.

9. Aiko's monthly cell-phone plan is as follows: Phone calls cost her \$0.20/minute and text messages cost \$0.15/message. Her maximum budget is \$30 every month.

- What is MAXIMUM number of text messages she can make per month?
- What is the MAXIMUM minutes of phone calls she can make per month?
- Can Aiko spend 30 minutes on phone calls and complete 100 text messages and stay within her budget?

10. The data below shows some heights of boys in grade 9 and the heights of their fathers.

Height of Grade 9 Boy (cm)	164	168	150	162	159	165	187	152	180	166	148	159
Height of Father (cm)	171	186	164	180	176	177	192	167	189	180	165	172

- Identify the independent variable and the dependent variable.
- Would you consider these variables to be discrete or continuous?
- Use your TI-84 to construct a scatter plot for this data set.
- Does the scatter plot suggest a relationship between a boy's height and his father's height?
- Is there a relationship between the variables? Suggest reasons for this.

### Part 3 - Extension Problems

11. As of January 10, 2019, the world's largest spokeless Ferris Wheel opened in Weifang, China and is called the "Bohai Eye." It is 475 ft tall and takes about 30 minutes to complete 1 revolution.
- Let's say that Mr S rides on the Ferris wheel for two revolutions. Sketch a graph showing the relationship between height of a rider (in meters above the bridge) and time.
  - State the domain and range of this relation. (for 2 revolutions)



<https://www.dailymail.co.uk/news/article-5735205/Worlds-largest-spokeless-Ferris-Wheel-opens-China.html>

### HOMEWORK PROBLEMS:

(1) Nelson 9, Chapter 5 Self Test, p311 , Q1-8