

## IM2 Problem Set 5.1 - Linear Functions

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BIG PICTURE of this UNIT:	<ul style="list-style-type: none"><li>• What is meant by the term FUNCTIONS and how do we work with them?</li><li>• mastery with working with basics &amp; applications of linear functions</li><li>• mastery with working with basics &amp; applications of linear systems</li><li>• understanding basics of function concepts and apply them to lines &amp; linear systems</li></ul>
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### Part 1 - Skills/Concepts Review

- Write the equations of the following lines in (i) slope-point form; (ii) slope-intercept form and (iii) standard form:
  - the line through the points A(1,2) and B(3,-4)
  - the line through the points A(3,-1) and B(7,7)
- Graph the following linear equations on DESMOS:
  - $f(x) = 2x + 6$  as well as  $f(x) = 2(x + 3)$ 
    - where are the  $x$ - and  $y$ -intercepts of this linear function?
    - is there any difference in the graphs?
  - $g(x) = -3x + 6$  as well as  $f(x) = -3(x - 2)$ 
    - where are the  $x$ - and  $y$ -intercepts of this linear function?
    - is there any difference in the graphs?
  - What is meant by the term “factoring” and what seems to be one reason why we do it?
- The function notation  $f(3) = 7$  communicates INFORMATION.
  - explain what the 3 means.
  - explain what the 7 means.
  - explain what the  $f$  means.
- For the following linear functions, determine the slope and  $x$ - and  $y$ -intercepts of the lines. Then graph the linear equations using your graphing calculator.
  - $g(x) = 5 - 2x$
  - $h(x) + 4 = -2(x + 3)$
  - $2x - 8y - 32 = 0$

### Part 2 - Skills/Concepts Application Problems

- Is  $x = 3$  a solution to the equation  $5(3x - 2) = 4 - (10 - 15x)$ ? If so, how do you know? If not, what is the solution to this equation?

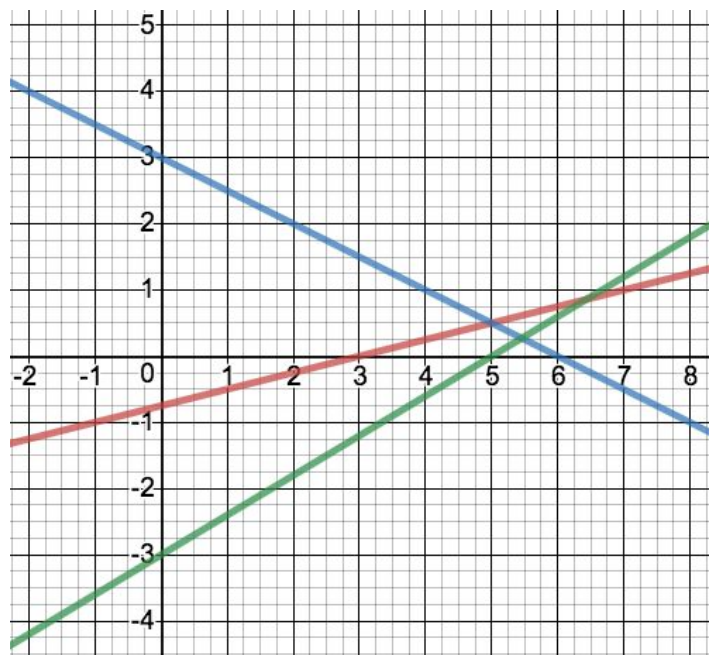
6. Evaluate the following:

a.  $f(5)$  if  $f(x) = 2x - 8$

b.  $f(\frac{1}{2})$  if  $f(x) = 7 + 4x$

c.  $g(2)$  if  $g(x) = -\frac{1}{4}x + 6$

7. 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.  $f(x) = mx + b$



8. A cell phone company offers a plan of \$25/month and \$0.10/min of talk. Let  $C$  represent the monthly costs for this phone plan and let  $n$  represent the number of minutes of talk used per month.

- Explain why this problem can be modeled with the linear relation  $C(n) = 25 + 0.10n$ .
- Which variable is the independent variable? Which variable is the dependent variable?
- Evaluate for  $C$  when  $n = 2$  hours. We will now write this as  $\Rightarrow$  Evaluate  $C(2)$ .
- Solve the equation  $35 = 25 + 0.10n$ . We will write this as  $\Rightarrow$  Solve  $C(n) = 35$

9. 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.

10. Given the relation  $3x + 4y - 6 = 0$ , determine the range if the domain was restricted to  $\{-2 < x \leq 6\}$ .

11. Given the relation  $3x + 4y - 6 = 0$ , determine the domain if the range was restricted to  $\{-3 \leq y < 6\}$ .

12. 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?

### Part 3 - Extension Problems

13. 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>

14. The formula for finding the surface area of a cylinder is  $S = 2\pi r^2 + 2\pi rh$ .
- Solve for  $h$  in terms of  $S$  and  $r$ .
  - Determine the height of a cylinder with a radius of 5 cm and a surface area of  $300\text{ cm}^2$ .
  - Solve for  $r$  in terms of the other variables.