IM2 Problem Set 5.6 - Linear 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. To sketch graphs of the following linear functions from standard form, we first find the x- and y-intercepts. Once we have the intercepts, we can plot the intercepts and then sketch the line.

   a. Sketch a graph of the line $2x - 3y = 18$ by first finding the intercepts.
   b. Sketch a graph of the line $4x + 5y = 60$ by first finding the intercepts.

2. Decide whether each ordered pair is a solution to the given system of equations:

   a. is the point (2,-1) a solution to the system given by: $3x + 2y = 4$ and $-x + 3y = -5$
   b. is the point (1,4) a solution to the system given by: $x + y = 5$ and $2x + 2y = 8$

3. If $h(x) = 3x - 5$,

a. evaluate	(i) $h(-2)$	(ii) $h(6)$	(iii) $h(4) - h(3)$	(iv) $h(2x + 1)$
b. solve	(i) $11 = h(x)$	(ii) $-8 = h(x)$	(iii) $a = h(x)$	(iv) $3x - 3 = h(x)$

4. STUCO is trying to determine where to hold prom. The ALGEBRA Ballroom charges a one-time fee of $800 plus $60 per person. The GEOMETRY Club charges a one time booking fee of $1000 and $55 person.

   a. How much would each facility charge if 30 people attended prom?
   b. Which facility should STUCO select and why? Show supporting evidence.

Part 2 - Skills/Concepts Application Problems

5. Sketch the following linear functions, given the conditions indicated:

   a. $g(x) = \frac{3}{4}x + 2$ on the domain of $[-4,8)$
   b. $2x - 5y - 20 = 0$ on the range of $\{-6 < y \leq 6\}$
   c. $y - 5 = -\frac{1}{2}(x + 4)$ on the range of $(-10,10]$

6. Use DESMOS to work through the following question:

    a. Graph the linear function defined by $3x + 2y = -3$
    b. Multiply this equation by 2 and describe what happens when you graph the new function.
    c. Multiply this equation by -5 and describe what happens when you graph the new function.

    d. Graph the linear function defined by $-2x + 5y = 21$
    e. Multiply this equation by 3 and describe what happens when you graph the new function.
    f. Multiply this equation by -2 and describe what happens when you graph the new function.

    g. Determine algebraically where the two functions intersect.

7. Seohui is considering three job offers. Pheonix Phasions offers her $1500/month plus 2.5% commission; Styles By Styx offers her $1250/month plus 5.5% commission; Chanel No 2 offers here $36,000 per year, regardless of her sales.

    a. Write equations for the salary offer from each company.
    b. Graph each equation on your calculator.
    c. How many intersection points are there and what does each intersection point mean?
    d. Which job offer should she accept? Explain your choice.

8. Use the substitution method to solve the linear systems defined by the following pairs of equations. Verify your solutions using (i) algebra and (ii) your graphing calculator.

    a. $L_1: y = 4x - 7$ and $L_2: 2x - 3y = 6$
    b. $L_1: f(x) = 5x - 8$ and $L_2: 10x - 5y = 7$

9. A linear system is defined by the equations $ax + 2y = -5$ and $3x - 4y = 1$ which may OR may not intersect - it depends upon the value of a.

    a. Find value(s) of a such that two lines DO NOT intersect.
    b. Hence, find value(s) of a such that the lines DO intersect.
    c. **EXTENSION**: What is/are the intersection point(s) - Express your answer in terms of a?

10. A rectangle has a perimeter of 40 meters.

    a. State three possible dimensions that this rectangle may have. Determine the area of each of your possible fields.
    b. One possible dimension of the rectangle has its length being 2 units longer than its width. Create a **linear system** to model this situation.
    c. Solve your linear system and explain what your solution means.

11. Use the elimination method to solve the linear systems defined by the following pairs of equations. Verify your solutions using (i) algebra and (ii) your graphing calculator.

    a. L_1: $3x + 2y = -3$ and L_2: $-2x + 5y = 21$.
    b. L_1: $x - 4y = -1$ and L_2: $-3x + 8y = -2$.

12. For the following sequences of numbers, describe the pattern and then predict the next 4 terms in each sequence as well as predicting the 3 numbers that preceded the first listed number. Finally, as a challenge, find the 50th term in each sequence.

    a. …., 5, 12, 19, 26, 33, ……
    b. …., 7, 4, 1, -2, -5, -8, …….
    c. …., 3.5, 2.75, 2, 1.25, 0.5, ……

Part 3 - Extension Problems

13. A function is defined by the following **recursion** formula: $f(n) = f(n - 1) - f(n - 2) + n$; $f(1) = 1$ and $f(2) = 1$ as well.

    a. Evaluate $f(3), f(4), f(5)$ and $f(6)$
    b. Hence or otherwise, evaluate $f(2018)$

14. A three-dimensional rectangular box with dimensions X, Y and Z has faces whose surface areas are 24, 24, 48, 48, 72 and 72. What is X + Y + Z equal to?