IM2 Problem Set 5.7 - 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. Graph the line $2x + 4y - 16 = 0$ on the domain of $\{x \in R \mid -2 \leq x \leq 6\}$. Sketch a copy into your notes, clearly labelling the "end points" of the line segment.

2. Amir earns \$9/h working in a coffee shop and earns \$11.25/h working in a grocery store. Last week, he earned \$288.

   a. Mr S writes the equation as $9x + 11.25y = 288$. What does x represent in this equation? What does y represent?
   b. The coefficients 9 and 11.25 represent RATES. Explain why.
   c. Graph this linear relation using (i) DESMOS and (ii) your graphing calculator.
   d. Determine the x- and y-intercepts. What might they mean?
   e. Determine 2 other points on the linear relation and explain what each point means.
   f. Determine the slope for this linear relation. What might the slope mean?

3. 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 75th term in each sequence.

   a. …., 91, 82, 73, 64, ……
   b. …., -34, -22, -10, 2, …….
   c. …., 128, 64, 32, 16, ……

4. A rocket is launched from a hill that is 700 m high. The rocket's height increases by 35 m every 2 s.

   a. Create a linear relation that models how the rocket's altitude changes over time.
   b. Graph this relation on your calculator.
   c. Use your linear relation to predict the rocket's height at 50 seconds and 100 seconds.
   d. Use your linear relation to determine how long it would take the rocket to reach a height of 1000 m.

Part 2 - Skills/Concepts Application Problems

5. Faisal is a cashier at a store. He has a total of \$580 in bills. He has 76 bills, consisting of \$5 bills and \$10 bills. How many of each type of bill does he have?

6. Solve the following linear systems using the substitution method.

   a. Line 1: $y = -2x + 5$ Line 2: $4x + 2y = 10$
   b. Line 1: $3x - 2y = 10$ Line 2: $x + 3y = 7$

7. ReadyCarz charges \$59/day plus \$0.14/km to rent a car whereas BestCARS charges \$69/day plus. \$0.11/km. Use may use DESMOS to help prepare your graphs.

   a. Mr. D wants to drive 200 km and rent for only one day. Which company should he use?
   b. Mr. S wants to rent a car for 2 days and drive from the airport to his home, which is a trip of 500 km. How much does each company charge for this trip.
   c. Mr R will use ReadyCarz. What would the graph of the function for ReadyCarz look like for a 2 day rental and a total trip of 700 km? Explain/describe any assumptions you are making.

8. You are given two linear functions. The first function is described by the equation $y - 5 = -\frac{4}{5}(x + 2)$ and the second linear function is defined by the equation $\frac{x}{7} - \frac{y}{M} = 1$, where M is a constant.

   a. For the function $\frac{x}{7} - \frac{y}{M} = 1$, let $M = 3$, so the equation now becomes $\frac{x}{7} - \frac{y}{3} = 1$. Determine the point where the 2 lines intersect. Show the algebraic work leading to your answer.
   b. Determine a value for M in the equation $\frac{x}{7} - \frac{y}{M} = 1$ for which this system of 2 equations has no solution. Show the algebraic work leading to your answer.

9. Solve the following linear systems using the elimination method:

   a. Line 1: $2x + y = 29$ Line 2: $4x - 3y = 18$
   b. Line 1: $5x + 2y = 18$ Line 2: $2x + 3y = 16$

10. CAC is putting on a play called Mathemagicks. Adult tickets are sold for \$8 and student tickets are sold for \$5. A total of 220 tickets are sold to the premiere and a total of \$1460 iss collected from ticket sales. How many of each type of ticket were sold?

11. Mr. Santowski was mowing lawns to make money for a video game! Mr. Santowski has 5 dollars in the bank. And for every lawn that he mows, he earns 3 dollars! A linear model will be used to model the relationship between the number of lawns mowed and amount of money he has.

   a. What is the slope of this relationship? What would be the slope represent?
   b. What is the y-intercept of this relationship? What would be the y-intercept represent?
   c. What is the x-intercept of this relationship? What would be the x-intercept represent?
   d. If Mr. S wants to buy a game that costs \$62, how many lawns must he mow?
   e. Does the point (4,17) lie on the graph of this relation? What does this point mean in context?
   f. Is there a part of the graph we should not include? Why/why not? Hence, state the domain and range of this relation.

12. The linear system $6x + 5y = 10$ and $ax + 2y = b$ has an infinite number of solutions. Determine the value(s) of a and b.

Part 3 - Extension Problems

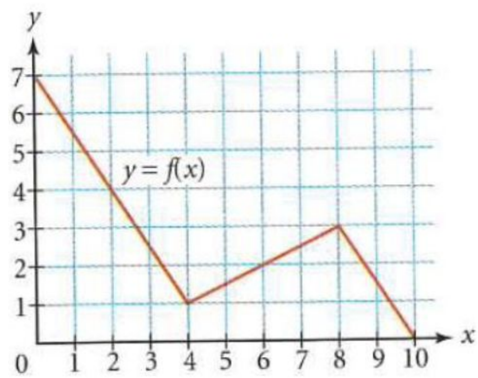
13. A phone plan charges \$1.29 for any call up to 20 minutes in length and 7 cents for each additional minute (or each part of a minute)

   a. What is the independent variable (input)? What would the domain be?
   b. What is the dependent variable (output)? What would the range be?
   c. Would you expect this relation to be a function? Why/why not?
   d. Determine the cost of a 52 minute phone call.
   e. How long would a call be if you had to pay \$2.41.
   f. To help draw a graph, complete the following table of values. Then graph this relation.

Time (min)	0	5	10	15	20	25	30	35	40
Cost (\$)									

   g. Now, how would you write an equation for this relation?

14. Use the graph to answer the following questions about the function, $y = f(x)$. In the graph $f(4) = 1$.



   a. Evaluate: $f(6)$, $f(2)$, $f(0)$, $f(5)$.
   b. For which values of x is $f(x) = 1$?
   c. State the domain and range of f.
   d. There are three linear segments in this function. Determine the equation of each segment and express in slope-intercept form.