

BIG PICTURE of this UNIT:

- How do we WORK WITH & EXTEND the concept of “functions”
- Why are linear equations written in different forms?
- How do we EXTEND our knowledge of LINEAR functions, beyond the basics of IM2?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ..... in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. The questions will involve basic ideas from IM2 Linear Relations UNIT including (i) functions, (ii) linear functions, (iii) GEOGEBRA and Co-ordinate Geometry. EVERY LESSON this semester will involve **spiralling through** these 4 major concepts as you will be given the opportunity to deepen and extend your conceptual knowledge & skill set on these 4 major themes as you see them multiple times in our lessons.

So, in your group, discuss & prepare solutions to the following questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS !!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. Use DESMOS as well as your TI-84 to graph the function  $f(x) = \frac{1}{x}$ . {11,13,15}
  - a. Use online resources to help you define “asymptote” and record a definition.
  - b. Does the function  $f(x) = \frac{1}{x}$  have asymptotes? If so, where? Prepare a sketch in your notes.
  - c. Now graph the transformed function,  $f(x) = \frac{1}{x+3} - 2$ . Explain how the two graphs compare. Present a sketch in your notes.
2. Use DESMOS to graph the following function  $g(x) = \frac{1}{x-4} + 6$  as well as the lines  $x = 4$  and  $y = 6$ . {15}
  - a. Sketch the function and state its domain and range.
  - b. Without technology, PREDICT where the function  $g(x) = \frac{1}{2x+8} + 5$  would have its asymptotes and sketch the function. NOW, verify with your TI-84.

3. For this question, you are working with the linear function  $f(x) = 3x - 5$ . {3,6,8}
- Determine where this line intersects with  $2x - 5y = 12$ . Verify your work algebraically. {6}
  - Write the equation of the line that is perpendicular to  $f(x)$  and goes through the point  $(-5, 2)$ . Write equation in point-slope form and then in standard form. {3}
  - Write the equation of the inverse function of  $f(x) = 3x - 5$ . Use correct notations in your final answer. {8}
  - Prepare sketches of each situation in Q(a), Q(b), Q(c) using GEOGEBRA. Copy diagrams into your notebook.
4. Working the linear function  $3x + 2y - 6 = 0$ : {3,4,8}
- Mr. S feels that the equation of this line in function notation is  $f(x) = \frac{3}{2}(x - 2)$ . True or false? {3,4}
  - Mr. S thinks the equation of the inverse is  $f^{-1}(x) = \frac{2}{3}x + 2$ . Explain/show **in three different ways** whether he is correct or not. {8,4}
5. Two functions are given as  $f(x) = \frac{1}{2}x + 5$  and  $g(x) + 4 = 2(x - 1)$ . {1,9,10}
- Determine the equations for  $y = f^{-1}(x)$  and  $y = g^{-1}(x)$
  - Evaluate the following:  
(i)  $f(4)$    (ii)  $g(4)$    (iii)  $g^{-1}(7)$    (iv)  $f^{-1}(-2)$   
(v)  $f(g^{-1}(3))$    (vi)  $f^{-1}(g(-4))$    (vii)  $g^{-1}(f^{-1}(3))$  {1,9}
6. An electronics store pays its employees by commission. The relation  $p(s) = 100 + 0.05s$  is used to find the employee's weekly pay,  $p$ , in dollars, and where  $s$  represents the employees weekly sales in dollars. {5,8}
- Describe the function in words.
  - Determine the equation of the inverse,  $p^{-1}(s)$ .
  - Describe the inverse relation in words.
  - Describe a situation where an employee might use the inverse function.
  - State a reasonable domain and range for  $p^{-1}(s)$ .

7. A relation is defined as  $h(x) = -4x + 6$  where  $\{x \mid -2 \leq x \leq 3, x \in R\}$ .  $\{1, 7, 8\}$
- Sketch a graph of  $y = h(x)$ .
  - Sketch a graph of  $y = h^{-1}(x)$ .
  - State the domain and range of  $y = h(x)$  and  $y = h^{-1}(x)$ .
  - Are  $h(x)$  and  $h^{-1}(x)$  functions?
  - Repeat parts a, b, c and d for  $h(x) = -4x + 6$  if  $\{x \mid -2 \leq x \leq 3, x \in Z\}$



**Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with linear relations and functions in general.**