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 including (i) functions, (ii) linear functions, (iii) exponential functions, and (iv) quadratic functions. 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. Last year, you were introduced to function notation. Explain what information is being communicated in the mathematical statement f(-2) = 5. Offer at least three different ideas. {1}

2. Determine the equation of the line that passes through the points A(2,5) and B(-4,8). Verify that your equation is correct and does in fact contain these two points. {3}

3. Use DESMOS to graph the line $2x – 4y = 12$. Then use ALGEBRAIC METHODS to determine the x- and y-intercepts (verify on DESMOS). Now sketch the linear function, labelling these 2 key points in your notes. Determine the slope of this line. **HENCE**, write the equation of this same line in slope-intercept form (also known as function form). {1,2,3}

4. Use your graphing calculator to graph $4x – 2y = 11$. Sketch the function and label the key points. {2}

5. To make a new seating arrangement, everyone in the group should now switch seats. Now **predict** how many different seating arrangements might be possible, given your group of 6-8 students. Be able to explain/justify the total number of seating arrangements possible. {P1}

6. Use DESMOS to graph (i) $f(x) = x^2 + 2x – 8$ and then (ii) $g(x) = (x + 4)(x – 2)$ and then (iii) $h(x) = (x + 1)^2 – 9$. What do you notice? Explain why? Sketch the parabolas and label their key features. {2,4}

(a) $2x + 5y = 10$

(b) $\frac{x}{5} + \frac{y}{2} = 1$

7. Use DESMOS to graph the following equations: (c) $y = -\frac{2}{5}x + 2$. What do you notice? {2,3,4}

(d) $f(x) = -\frac{2}{5}x + 2$

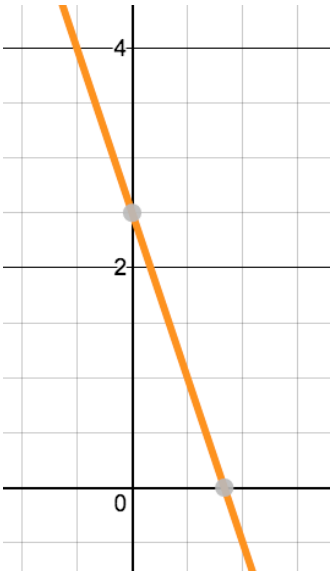
(e) $f(x) = -\frac{2}{5}(x - 5)$

8. Determine the equation of the perpendicular bisector of the line segment between A(2,-4) and B(6,2). Include a sketch of both lines in your notes. {3}

9. Everyone in your group should now SIMULTANEOUSLY clap their hands three times. {P1}

10. Use algebra to find the intersection point of the two lines 2x – 6y = 21 and 3x + 2y = 4. Verify using your GDC using POLYSMLT. {2,6}
(http://www.dummies.com/how-to/content/the-plysmlt2-app-on-your-ti84-plus-calculator.html)

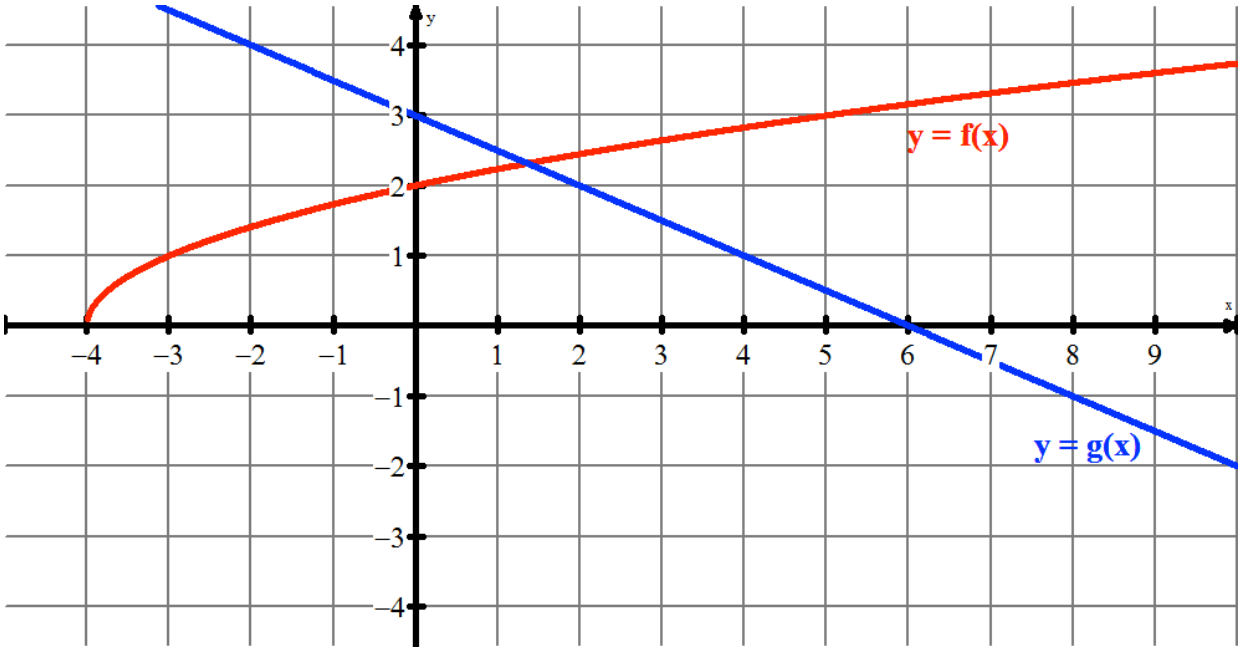
11. Given the linear equation 2y – 6x = 12, write the equation in function form. Graph the function using DESMOS. {2,8}
    a. Now graph the line 2x – 6y = 12. How is this second linear equation **different** than the first linear equation?
    b. Now also graph the line y = x and describe what you observe with the three linear functions.



12. Given the graph of linear function on the right, {1,2,3,6}
    a. Write the equation in (i) slope-intercept (or function) form, (ii) point-slope form and (iii) standard form.
    b. Write the equation of a NEW line that intersects the given line at (0.5,1)

A. HOMEWORK ➔ Working with Graphs

Here is a graph showing two functions, y = f(x) and y = g(x), determine each of the following: {1}



(a) Determine f(0)

(b) Determine f(-3) as well as f(-5)

(c) Determine the value of x if f(x) = 3

(d) State the domain and range of y = f(x)

(a) Determine g(4)

(b) Determine g(-1)

(c) Determine the value of x if g(x) = -1

(d) State the domain and range of y = g(x)

(e) CONCEPT EXTENSION Questions:

(i) Determine the value of g(0) – f(0)

(ii) Estimate the value of g(7) – f(7)

(iii) Determine the value of g(5) – g(4)

(iv) Determine the value of the expression $\frac{g(4)-g(2)}{4-2}$? What is the meaning of this value?

(iii) How would you solve a question like "where is g(x) > f(x)"?

(iii) What does the question "Solve for x if f(x) = g(x)" mean?