

Lesson 3 – Linear Functions

IB Math SL1 - Santowski

8/13/2010

Math SL1 - Santowski

1

Fast Five

- Write an equation that I can use to convert degrees Fahrenheit into degrees Celcius
- Write an equation that I can use to convert degrees Celcius into degrees Fahrenheit
- (You are expected to have some ASSUMED PRIOR KNOWLEDGE to answer this question!!!!!!!)

8/13/2010

Math SL1 - Santowski

2

Lesson Objectives

- Definition of linear functions.
- What are the x- and y-intercepts & how do we find them?
- What is the slope of a linear function & how do we find it and its meaning?
- The meaning of the sign of the slope.
- Know how to graph a line given two points, a point and the slope, or the equation of the line.
- How do we find the equation of a line, given a point and the slope, or two points?
- Given a word problem involving linear functions, be able to make points from the data and find the appropriate linear function describing the problem.

8/13/2010

Math SL1 - Santowski

3

BIG PICTURE

- Each type of function that we will be studying in this course will have some **features common** with other types of functions BUT will also have some features **unique** to itself
- Does each function that we study in this course have some **COMMON "operations/manipulations"** that make the study of a myriad of functions that much easier?

8/13/2010

Math SL1 - Santowski

4

(A) Features of Linear Functions

- For the following linear functions, determine the (i) slope, (ii) y-intercept, (iii) x-intercept, (iv) domain and (v) range
- (i) $y = -2x + 7$
- (ii) $2x - 3y + 12 = 0$
- (iii) $y - 4 = \frac{1}{2}(x + 3)$

8/13/2010

Math SL1 - Santowski

5

(A) Features of Linear Functions

- (1) Describe (in words and graphically) the family of lines given by the equation $f(x) = 2x + b$
- (2) Describe (in words and graphically) the family of lines given by the equation $f(x) = mx + 2$

8/13/2010

Math SL1 - Santowski

6

(A) Linear Functions - Modeling

- Write an equation for the following application of linear functions:
- My car was purchased for php 800,000 and its value depreciates by php 100,000 every year.
- For this application, determine and interpret the (i) slope, (ii) y-intercept, (iii) x-intercept, (iv) domain and (v) range

8/13/2010

Math SL1 - Santowski

7

(B) Slope

- (a) Interpretation of slope
- (b) Meaning of:
 - (i) positive slope,
 - (ii) negative slope
- (c) calculation of slope – formulas →
- Examples:
 - (i) calculate slope given 2 points → (-2,5) and (4,-7)
 - (ii) Calculate slope given the equation $2x - 3y = 8$
 - (iii) Determine the average rate of change for a vehicle whose times and distance travelled are given by A(5 sec, 60 m) and B(10 sec, 120 m)

8/13/2010

Math SL1 - Santowski

8

(C) Equations of Lines

- (i) slope - intercept form →
- (ii) standard form →
- (iii) point-slope form →
- Determine the equation of the line through A(-2,3) and B(3,-7) and express the equation in all 3 forms

8/13/2010

Math SL1 - Santowski

9

(D) Parallel & Perpendicular Lines

- If two lines are parallel, then ...
- If two lines are perpendicular, then ...

8/13/2010

Math SL1 - Santowski

10

(D) Parallel & Perpendicular Lines

- (i) Determine the equation of the line parallel to $2x - 3y + 5 = 0$ and passing through the point (4,-7)
- (ii) Determine the equation of the perpendicular bisector of the line joining the points (2,3) and (4,7)

8/13/2010

Math SL1 - Santowski

11

(E) Horizontal & Vertical Lines

- The equation of a line parallel to the x-axis (i.e. a horizontal line) is ...
- The equation of line parallel to the y-axis (i.e. a vertical line) is ...

8/13/2010

Math SL1 - Santowski

12

(F) Graphing a Line

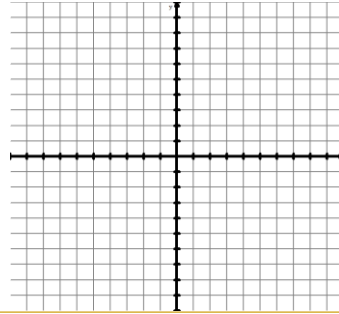
- (1) Graph the linear function $f(x) = 1/3x - 2$ using the slope/point method
- (2) Graph the linear function $2x + 4y - 16 = 0$ using the intercept method
- (3) Graph the linear function $f(x) - 200 = 5x + 100$ by finding ordered pairs

8/13/2010

Math SL1 - Santowski

13

(F) Graphing a Line



8/13/2010

Math SL1 - Santowski

14

(G) Consolidation of Skills

- A second unifying theme in the SL1 course is that of **data analysis**
- Data tables showing time and speed of a falling object if (a) air resistance is NOT considered and (b) if air resistance is considered
- Consider the following sets of data. Do they indicate a linear relationship between the independent and dependent variables? EXPLAIN why/why not.

Time (s)	Speed A (m/s)	Speed B (m/s)
0	0	0
1	9.8	9.6
2	19.6	16.6
3	29.4	23.1
4	39.2	30.8
5	49	34.2

8/13/2010

Math SL1 - Santowski

15

(F) Internet Resources

- <http://science.kennesaw.edu/~plaval/math1113/linear.pdf>
- From Purple Math → <http://www.purplemath.com/modules/slope.htm>
- From Purple Math → <http://www.purplemath.com/modules/strlineq.htm>
- Video Links: → Finding Slope of a Line → http://www.youtube.com/watch?v=O8fo4H_185q&feature=channel
- Video Links → Linear Functions → <http://www.youtube.com/watch?v=i24BNsolbFs>

8/13/2010

Math SL1 - Santowski

16

(G) Homework

- HW from HH Textbook:
- Sec 7A, p136, Q3ab, 4ab, 7ab, 8ab, 9ab, 11bc
- Sec 7B.1, p139; Q1ac, 2de, 4ab
- Sec 7B2, p140; Q5

8/13/2010

Math SL1 - Santowski

17

(G) Consolidation of Skills – EXTENSION of Skills

- (1) Let $f(x) = x + 1$ and let $g(x) = x - 4$.
- Graph $y = f(x)$ and then graph $y = fog(x)$ and describe appearance of the new equation $y = fog(x)$
- (2) Let $f(x) = 2x - 3$ and let $g(x) = ax + b$. If $fog(x) = x$, determine value(s) for a and b .
- The value(s) for a and b do/do not change if $gof(x) = x$?

8/13/2010

Math SL1 - Santowski

18

(G) Consolidation of Skills – EXTENSION of Skills

- BIG PICTURE → Does each function that we study in this course have some **COMMON “operations/manipulations”** that make the study of a myriad of functions that much easier?
- Explain the similarities & differences between the following 2 equations:
 - $f(x) = 6$ and $f(x) - 6 = 0$
 - $f(x) = g(x)$ and $f(x) - g(x) = 0$