Lesson 6: Graphs of Linear Functions and Rate of Change

Classwork

Opening Exercise

A function is said to be linear if the rule defining the function can be described by a linear equation.

Functions 1, 2, and 3 have table-values as shown. Which of these functions appear to be linear? Justify your answers.

Input	Output
2	5
4	7
5	8
8	11

Input	Output
2	4
3	9
4	16
5	25

Input	Output
0	−3
1	1
2	6
3	9

Exercise

A function assigns the inputs shown the corresponding outputs given in the table below.

Input	Output
1	2
2	-1
4	-7
6	-13

a. Do you suspect the function is linear? Compute the rate of change of this data for at least three pairs of inputs and their corresponding outputs.

b. What equation seems to describe the function?

c. As you did not verify that the rate of change is constant across all input/output pairs, check that the equation you found in part (a) does indeed produce the correct output for each of the four inputs 1, 2, 4, and 6.

d. What will the graph of the function look like? Explain.

Lesson Summary

If the rate of change for pairs of inputs and corresponding outputs for a function is the same for all pairs (constant), then the function is a linear function. It can thus be described by a linear equation $y = mx + b$.

The graph of a linear function will be a set of points contained in a line. If the linear function is discrete, then its graph will be a set of distinct collinear points. If the linear function is not discrete, then its graph will be a full straight line or a portion of the line (as appropriate for the context of the problem).

Problem Set

1. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
3	9
9	17
12	21
15	25

   a. Does the function appear to be linear? Check at least three pairs of inputs and their corresponding outputs.

   b. Find a linear equation that describes the function.

   c. What will the graph of the function look like? Explain.

2. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
-1	2
0	0
1	2
2	8
3	18

   a. Is the function a linear function?

   b. What equation describes the function?

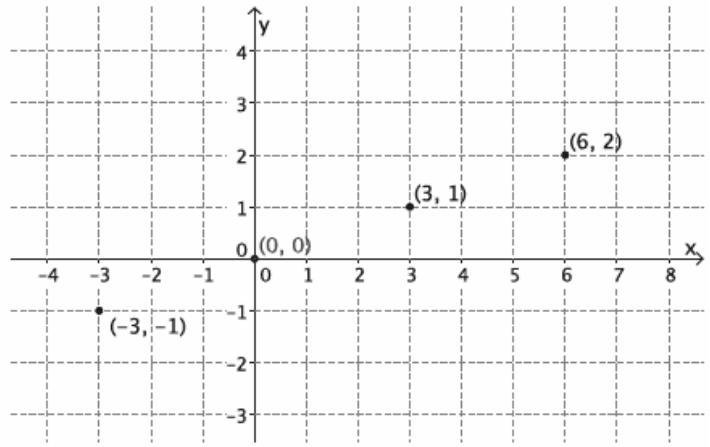
3. A function assigns the inputs and corresponding outputs shown in the table below.

Input	Output
0.2	2
0.6	6
1.5	15
2.1	21

   a. Does the function appear to be linear? Check at least three pairs of inputs and their corresponding outputs.
   b. Find a linear equation that describes the function.
   c. What will the graph of the function look like? Explain.

4. Martin says that you only need to check the first and last input and output values to determine if the function is linear. Is he correct? Explain.

5. Is the following graph a graph of a linear function? How would you determine if it is a linear function?



6. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
−6	−6
−5	−5
−4	−4
−2	−2

   a. Does the function appear to be a linear function?
   b. What equation describes the function?
   c. What will the graph of the function look like? Explain.