



Problem 1 – Review Linear Functions

When studying linear functions, you were able to find the slope by finding the difference between the x - and y -values and writing them as a ratio.

On page 1.3, x changes by 1. Find the difference between consecutive y -values and write an equation that fits the data. Plot your function on the graph using **MENU > Analyze > Plot Function**.

Use the table to record the differences.

x	y	1st difference

1. What is the relationship between the degree of a linear function and the number of times you had to subtract the y -values to find the same difference?

Problem 2 – Finding Finite Differences, Part 1

For the data on page 2.2, find the difference of consecutive y -values (i.e. $f(2) - f(1)$). Keep repeating until the differences are the same. Try to use formulas to find the differences on the spreadsheet.

2. How many times did you have to find the difference between the y -values until they were all the same?

Next, examine the graph and find an equation that models the data. Note the relationship between the degree of the equation and the number of times you took the difference.

3. What is a function that models the data?



Problem 3 – Finding Finite Differences, Part 2

For the data on page 3.2, find the difference of consecutive y -values. Keep repeating until the differences are the same. Try to use formulas to find the differences on the spreadsheet.

4. How many times did you have to find the difference between the y -values until they were all the same?

Next, examine the graph and find an equation that models the data. Note the relationship between the degree of the equation and the number of times you took the difference.

5. What is the function that models the data?

Extension – Using Matrices to find Equations

For Problem 1, the data is modeled by the polynomial $y = ax + b$. We can use matrices to find the values of a and b .

6. Write the general form of a linear equation two times. In one of them, substitute the x - and y -values of third point given in the table on page 1.3. In the other, substitute the x - and y -values of the fourth point. You will now have a system of equations.

7. Now write the system of equations as a matrix equation: (part of it is done for you)

$$\begin{pmatrix} & \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$$

8. Use the inverse of a matrix to solve the matrix equation on page 4.4. You should find the same values for a and b as in Problem 1.
9. Use the same process for Problems 2 and 3 by using the general equations for a quadratic and cubic polynomials and substituting in the correct number of points to get the equation. Write each system of equations and matrix equation below before solving the matrix equations on page 4.7.