

## Finite Differences

Finite differences can be used to examine the nature of change in polynomial functions.

### LINEAR FUNCTIONS      $y = mx + b$

Example 1. Construct a difference table for the function  $y = 3x - 2$

X	Y	Difference
-1	-5	
0	-2	
1	1	
2	4	
3	7	

\*\* Notice that the differences are all the same and are the same as the \_\_\_\_\_ value.

Example 2: Use finite differences to write an equation for the following

X	Y
-2	14
-1	8
0	2
1	-4
2	-10

**Quadratic Functions:**

Example 3: Construct a difference table for the equation:

$$y = 3x^2 - x + 2$$

X	Y	Differences	
		First	Second
-2	16		
-1	6		
0	2		
1	4		
2	12		

Notice that the second difference is \_\_\_\_\_

If we were to do many more examples, the second difference would always be equal to \_\_\_\_\_

Example 4: Given the above difference value calculate the equation of the quadratic function.

(Assume you don't know the equation already 😊)

Find the a value:

Calculate the c value:            let x =

To find the b value pick a set of coordinates and substitute:

**Cubic Functions:**

Example 5: Construct a difference table for the equation  
 $y=2x^3 - 3x + 4$

X	Y	Differences		
		First	Second	Third
-2	-6			
-1	5			
0	4			
1	3			
2	14			

Notice that for this cubic function the third differences are all the same!!

If we were to do more examples we would see that the third differences would always be equal to \_\_\_\_\_

Example 6: Using the above difference table, calculate the equation of the cubic function.

(AGAIN, assume we don't already know the equation ☺)

First find the a value:

Then find the d value: (let  $x = \underline{\quad}$ )

To find b and c we need to use the coordinates of two different points and then solve the 2 equations.