



Finite Differences Exploration

In this activity, we're going to examine the changes in y as x changes in polynomial functions. We're going to define the second change in y as finding the difference between the original change in y , i.e. the change in the change in y . The third, fourth, etc. changes in y are defined similarly.

In the problems below, plug in the given values for x to see what you get for y . Then, find the change in x (Δx), the change in y (Δy), the second change in y (Δy_2), the third change in y (Δy_3), etc. as indicated.

A) $y = 2x + 3$

B) $y = x^2 + x + 1$

C) $y = x^3$

Δx Δy

x	y
0	
1	
2	
3	
4	
5	

Δx Δy Δy_2

x	y
0	
1	
2	
3	
4	
5	

Δx Δy Δy_2 Δy_3

x	y
0	
1	
2	
3	
4	
5	

Degree = _____

Degree = _____

Degree = _____

- In all three of the above functions, the Δx is constant. What is this Δx ? _____
- In function A, what do you notice in general about Δy when Δx is constant? _____
- In function B, what do you notice in general about Δy_2 when Δx is constant? _____
- In function C, what do you notice in general about Δy_3 when Δx is constant? _____
- What is the relationship between the degree of the function and the change in y that is constant?

6. What are the degrees of the functions below if the given change in y is constant?

- a) Δy_5 is constant b) Δy_9 is constant c) Δy_{16} is constant d) Δy_n is constant

7. Which change in y is constant for the functions below with the given degree?

- a) Degree = 6 b) Degree = 10 c) Degree = 21 d) Degree = 55

8. Create a function of degree 4 and show that Δy_4 is constant for your function.

$y =$ _____

Δx

x	y
0	
1	
2	
3	
4	
5	
6	

Δy

Δy_2

Δy_3

Δy_4