

3.2 Notes

What is a Quadratic?

has  $x^2$  as its largest exponent

What type of graph does a quadratic make?

↕ ↖ Parabola

Standard form of a quadratic  $y = ax^2 + bx + c$

First Difference:

difference between  $y$ -values

Second difference:

difference between 1<sup>st</sup> differences

x	f(x)	1 <sup>st</sup> difference	2 <sup>nd</sup> difference
0	1	+5	+6
1	6		
2	17	+11	+6
3	34	+17	+6
4	57	+23	+6
5	86	+29	+6

Explicit equation:

How to find a & c from above:

$a \rightarrow 2^{\text{nd}} \text{ difference} \div 2$

$c \rightarrow \text{Zero Term (when } x=0)$

Plug in a point to find  $b!$   
not  $x=0$

$$3x^2 + bx + 1 = y$$

$$3(1)^2 + b(1) + 1 = b \quad \left\{ \begin{array}{l} 3 + b + 1 = b \\ 4 + b = b \\ b = 2 \end{array} \right.$$

$$3 \cdot 1 + b + 1 = b$$

Explicit equation:  $y = 3x^2 + 2x + 1$

$y = mx + b$  ○ Linear: 1<sup>st</sup> differences are the same  
2<sup>nd</sup> differences are 0

$y = a \cdot b^x$  ○ Exponential: 1<sup>st</sup> and 2<sup>nd</sup> differences are both different

$y = ax^2 + bx + c$  ○ Quadratic: 1<sup>st</sup> difference is not the same, but 2<sup>nd</sup> difference is

$y = c$  ○ Constant: Both are 0

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x	f(x)	First Difference	Second Difference
-3	4	-4	+2
-2	0		
-1	-2	-2	+2
0	-2	0	+2
1	0	+2	+2
2	4	+4	+2
3	10	+6	+2

Constant/Linear/quadratic/exponential?

Explicit equation:  $y = x^2 + x - 2$

$$0 = 1^2 + b(1) - 2$$

$$0 = 1 + b - 2$$

$$0 = b - 1$$

$$b = 1$$

f(43) = \_\_\_\_\_

x	f(x)	First Difference	Second Difference
0	1	+3	+2
1	4		
2	9	+5	+2
3	16	+7	+2
4	25	+9	+2

Constant/Linear/quadratic/exponential?

Explicit equation:  $y = x^2 + 2x + 1$

$$4 = 1^2 + b(1) + 1$$

$$4 = 1 + b + 1$$

$$4 = 2 + b$$

$$b = 2$$

f(43) = \_\_\_\_\_

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x	f(x)	First Difference	Second Difference
0	4	} +3 } +3 } +3 } +3 } +3	0  ↓
1	7		
2	10		
3	13		
4	15		

Constant/Linear/quadratic/exponential?

Explicit equation:  $y = 3x + 4$

f(43) = \_\_\_\_\_

x	f(x)	First Difference	Second Difference
0	1	} +1 } +2 } +4 } +8	} 1 } 2 } 4
1	2		
2	4		
3	8		
4	16		

Constant/Linear/quadratic/exponential?

Explicit equation:  $y = 1 \cdot 2^x$

f(43) = \_\_\_\_\_

3.2 Notes

x	f(x)	First Difference	Second Difference
0	-4	0	0
1	-4	↓	↓
2	-4		
3	-4		
4	-4		

Constant/Linear/quadratic/exponential?

Explicit equation:  $y = -4$

f(43) = -4