



Step Patterns of Quadratic Relations

Video Notes

[Video Link](#)

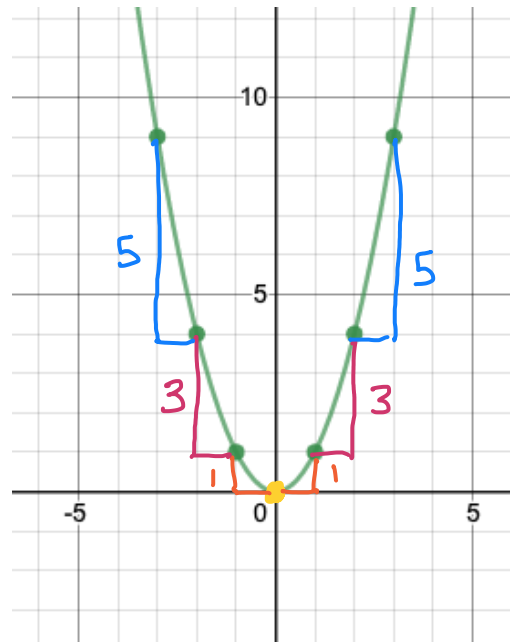
Step Patterns of Quadratic Relations

Take a look at the table of values below for $y = x^2$. Find the first differences and make a conclusion about the step pattern.

x	x^2
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16
7	49

Handwritten annotations: $+1 <$ on the left of each row, $> -5, -3, -1, 1, 3, 5, 7$ on the right of each row. A horizontal line is drawn under the $x=3$ row.

Step Pattern:
vertex, 1, 3, 5, 7, ...

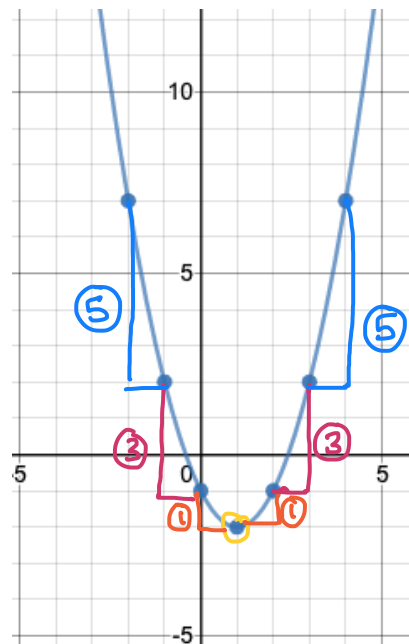


Take a look at the table of values below for $y = x^2 - 2x - 1$. Find the first differences and make a conclusion about the step pattern.

x	$x^2 - 2x - 1$
-2	7
-1	2
0	-1
1	-2
2	-1
3	2
4	7

Handwritten annotations: Blue arrows pointing right from each row to the next, labeled 5, 3, 1, 1, 3, 5. The word 'vertex' is written vertically on the left side of the table.

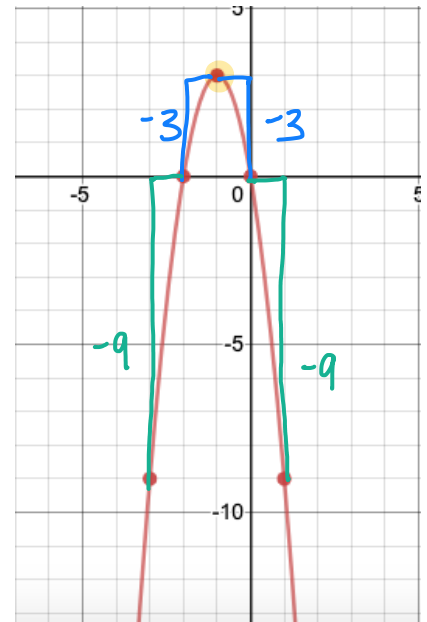
Step Pattern:
vertex, 1, 3, 5, 7, ...



Take a look at the table of values below for $y = -3x^2 - 6x$. Find the first differences and make a conclusion about the step pattern.

x	N $-3x^2 - 6x$
-4	-24
-3	-9
-2	0
Vertex -1	3
0	0
1	-9
2	-24

Step Pattern:
 vertex, $\frac{-3}{-3}, \frac{-9}{-3}, \frac{-15}{-3}, \frac{-21}{-3}$
 $1, 3, 5, 7, \dots$



$$y = -3x^2 - 6x$$

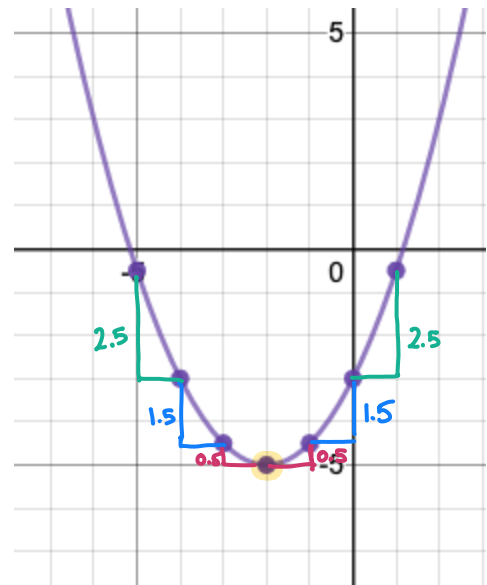
$$y = -3(3)^2 - 6(3)$$

$$y = -27 - 18$$

$$y = -45$$

Take a look at the table of values below for $y = \frac{1}{2}x^2 + 2x - 3$. Find the first differences and make a conclusion about the step pattern.

x	N $\frac{1}{2}x^2 + 2x - 3$
-5	-0.5
-4	-3
-3	-4.5
Vertex -2	-5
-1	-4.5
0	-3
1	-0.5



Step Pattern:

vertex, $\frac{0.5}{0.5}, \frac{1.5}{0.5}, \frac{2.5}{0.5}, \dots$
 $1, 3, 5, \dots$

$\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \dots$

Conclusion:

Equation:

Step Pattern:

$$y = x^2$$

$$a = 1$$

$$\underline{1, 3, 5, 7, \dots}$$

$$y = 1x^2 - 2x - 1$$

$$a = 1$$

$$\underline{1, 3, 5, 7, \dots}$$

$$y = -3x^2 - 6x$$

$$a = -3$$

$$\begin{aligned} & -3 \cdot 1, -3 \cdot 3, -3 \cdot 5, -3 \cdot 7, \dots \\ & -3, -9, -15, -21, \dots \end{aligned}$$

$$y = \frac{1}{2}x^2 + 2x - 3$$

$$a = \frac{1}{2}$$

$$\begin{aligned} & \frac{1}{2} \cdot 1, \frac{1}{2} \cdot 3, \frac{1}{2} \cdot 5, \frac{1}{2} \cdot 7, \dots \\ & \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \dots \end{aligned}$$

$$y = ax^2 + bx + c$$

$$1a, 3a, 5a, 7a, \dots$$