

<u>Intro to Quadratic Relations</u>	
So far: Linear Relations	New: Quadratic Relations
Equation: $y = mx + b$ m is slope, b is y-intercept highest exponent of x is 1	Equation: $y = ax^2 + bx + c$ a, b, and c are coefficients highest exponent of x is 2 (degree, or order, of 2)

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Recall: To graph a relationship, we can use a table of values (or TOV).

1. Pick some values for x .
2. Sub each x -value into the equation.
3. Determine values for y .
4. Plot each point (x, y) on the x - y plane.
5. (Optional) Calculate first differences, which are the differences between *consecutive* y -values for *consecutive* x -values.

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Create a TOV for $y = 2x + 1$

x	$y = 2x + 1$	$\Delta y = y_2 - y_1$
0	$2(0) + 1 = 1$	
1	$2(1) + 1 = 3$	$3 - 1 = 2$
2	5	$5 - 3 = 2$
3	7	$7 - 5 = 2$
4	9	$9 - 7 = 2$

' Δ ' (delta) means "change in" or "difference".
 Δy is the change in y , or the first difference.

In a linear relationship, the first differences are constant.

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Ex.1. Create a TOV and graph $y = x^2$

$\Delta(\Delta y)$

x	$y = x^2$	Δy	$\Delta^2 y$
-2	$(-2)^2 = 4$		
-1	$(-1)^2 = 1$	$1 - 4 = -3$	
0	$0^2 = 0$	$0 - 1 = -1$	$-1 - (-3) = 2$
1	$1^2 = 1$	$1 - 0 = 1$	$1 - (-1) = 2$
2	$2^2 = 4$	$4 - 1 = 3$	$3 - 1 = 2$

$\Delta^2 y$ is the change in Δy , or change in 1st differences.

$\Delta^2 y$ is the second difference.

In a quadratic relationship, first differences are different and second differences are constant.

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x	y	Δy	$\Delta^2 y$

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Ex. Create a TOV and graph $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4

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Ex. Create a TOV and graph $y = -x^2 + 2x + 3$.

x	y = -x ² + 2x + 3	Δy	Δ ² y
-1	$-(-1)^2 + 2(-1) + 3 = 0$		
0	$-(0)^2 + 2(0) + 3 = 3$	$3 - 0 = 3$	$1 - 3 = -2$
1	$-(1)^2 + 2(1) + 3 = 4$	$4 - 3 = 1$	$-1 - 1 = -2$
2	$-(2)^2 + 2(2) + 3 = 3$	$3 - 4 = -1$	$-3 - (-1) = -2$
3	$-(3)^2 + 2(3) + 3 = 0$ <small>$-9 + 6 + 3 = 0$</small>	$0 - 3 = -3$	

$y = -(2)^2 + (2)(2) + 3 = -4 + 4 + 3 = 3$

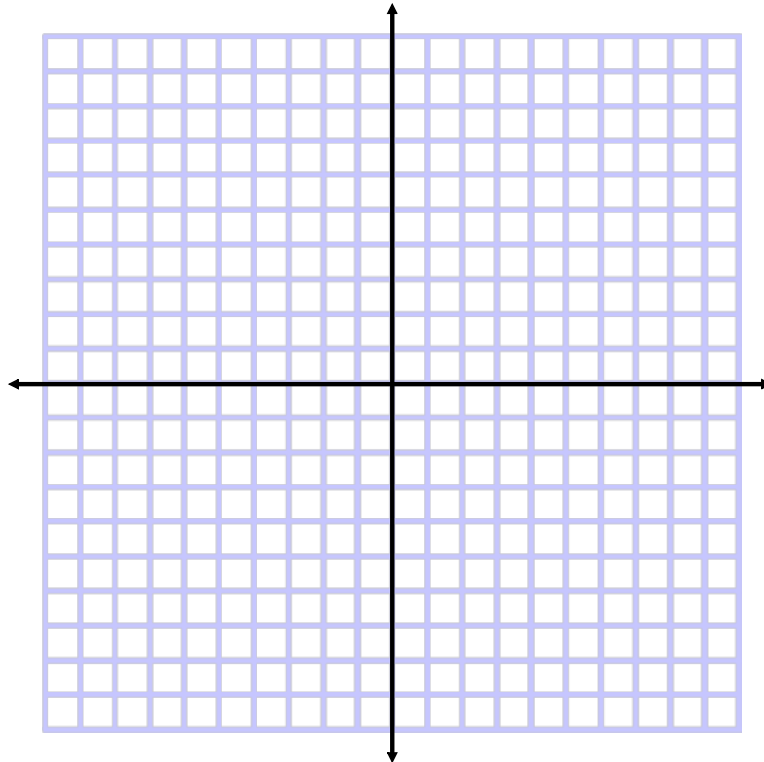
$-(-1)^2 + 2(-1) + 3 = -1 - 2 + 3 = 0$

$-(x)^2 = (-1)(x)^2$

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Ex. Create a TOV and graph $y = -x^2 + 2x + 3$.

x	y
-1	0
0	3
1	4
2	3
3	0



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For any parabola, $y = ax^2 + bx + c$, the direction of opening can be determined from:

- the graph
- the sign of the 2nd difference
- the sign of "a"

Positive "a" value \Rightarrow parabola opens UP.

Positive 2nd difference \Rightarrow

Negative "a" value \Rightarrow parabola opens DOWN.

Negative 2nd difference \Rightarrow

Assigned Work:

p. 137 # 1, 2, 3, 4, 5ab, 6, 7

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Assigned Work:

p. 137 # 1, 2, 3, 4, 5ab, 6, 7

ii

$$3. \text{ (ii) } y = x^2 - 6x + 4$$

1 2 1 0

2. degree 2

for y-int, set $x = 0$

$$y = (0)^2 - 6(0) + 4$$

$$y = 4$$

$$y = 2x - 3$$

Nov 1-8:01 AM