Intro to Quadratic Relations

March 21/2016

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

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

$\Delta^2 y$ 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 = _____	1st diff Δy	2nd diff $\Delta^2 y$

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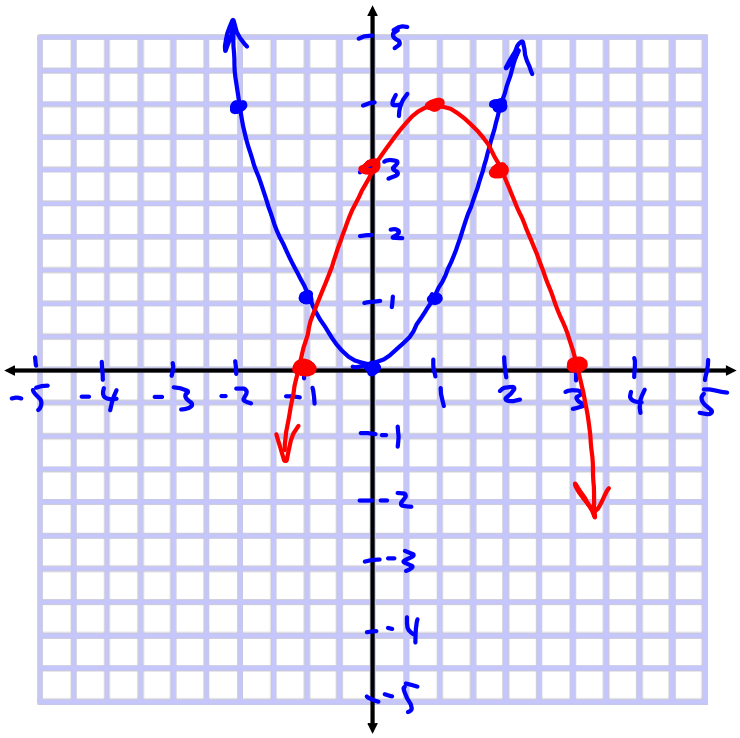
Ex. Create a TOV and graph $y = x^2$

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



Mar 16-8:48 AM

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

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

$x = -1$: $y = -(-1)^2 + 2(-1) + 3$ $-(0)^2 + 2(0) + 3$

$= -1 - 2 + 3$ $= 3$

$= 0$

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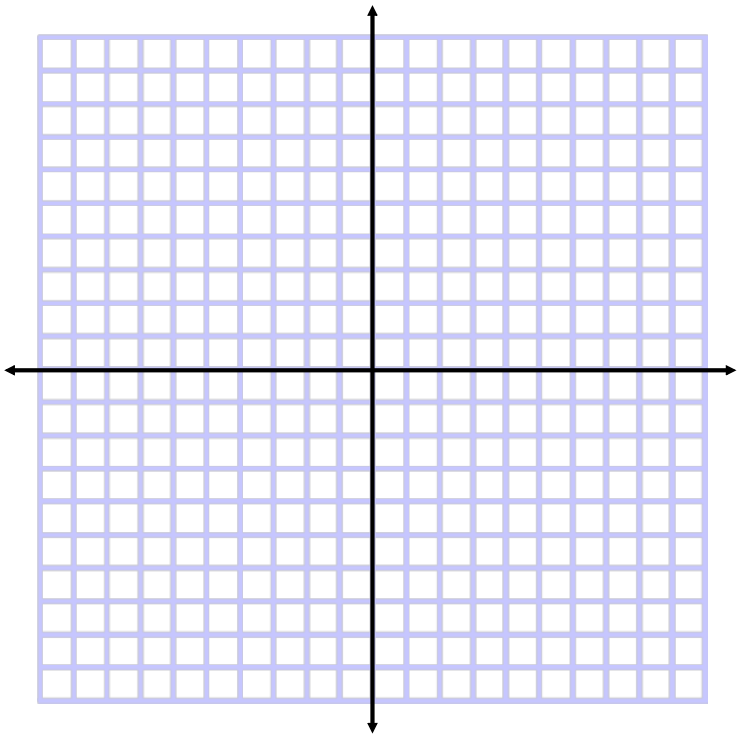
Ex. Create a TOV and graph $y = -x^2 + 2x + 3$.

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
Positive 2nd difference $\Rightarrow$ parabola opens UP.

Negative "a" value
Negative 2nd difference $\Rightarrow$ parabola opens DOWN.

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)

7. $y = ax^2 + bx + c \qquad a \neq 0$

try $a = 0$: $y = (0)x^2 + bx + c$

$y = 0 + bx + c$

$y = bx + c$

if $a = 0$, it becomes a linear (not quadratic) equation.

Nov 1-8:01 AM

$y' = 2x^2 + 5x - 3$

1 2 1 0

1 2 1 0

2

$y = 3x + 2$

1

$y = 3$

1

$y^2 = 3x + 2$

$xy = x^2y^2 + 3x^3 + 7y$

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