Unit 3 - Quadratic Relations   Oct 18/2011

Intro to Quadratic Relations

So far: Linear Relations	New: Quadratic Relations
Equation: $y = mx^1 + b$	Equation: $y = ax^2 + bx^1 + c$

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Recall: To graph a relationship, we can use
        a <u>table of values</u> (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 <u>first differences</u>, which are
     the differences between *consecutive* y-values
     for *consecutive* x-values.

Apr 14-7:45 PM

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

x	y = 2x + 1	Δy = $y_2 - y_1$
−2	2(−2)+1 = −3	
−1	2(−1)+1 = −1	−1−(−3) = 2
0	2(0)+1 = 1	1−(−1) = 2
1	2(1)+1 = 3	3−1 = 2
2	2(2)+1 = 5	5−3 = 2

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

In a linear relationship, the first differences are ___the same___.
constant
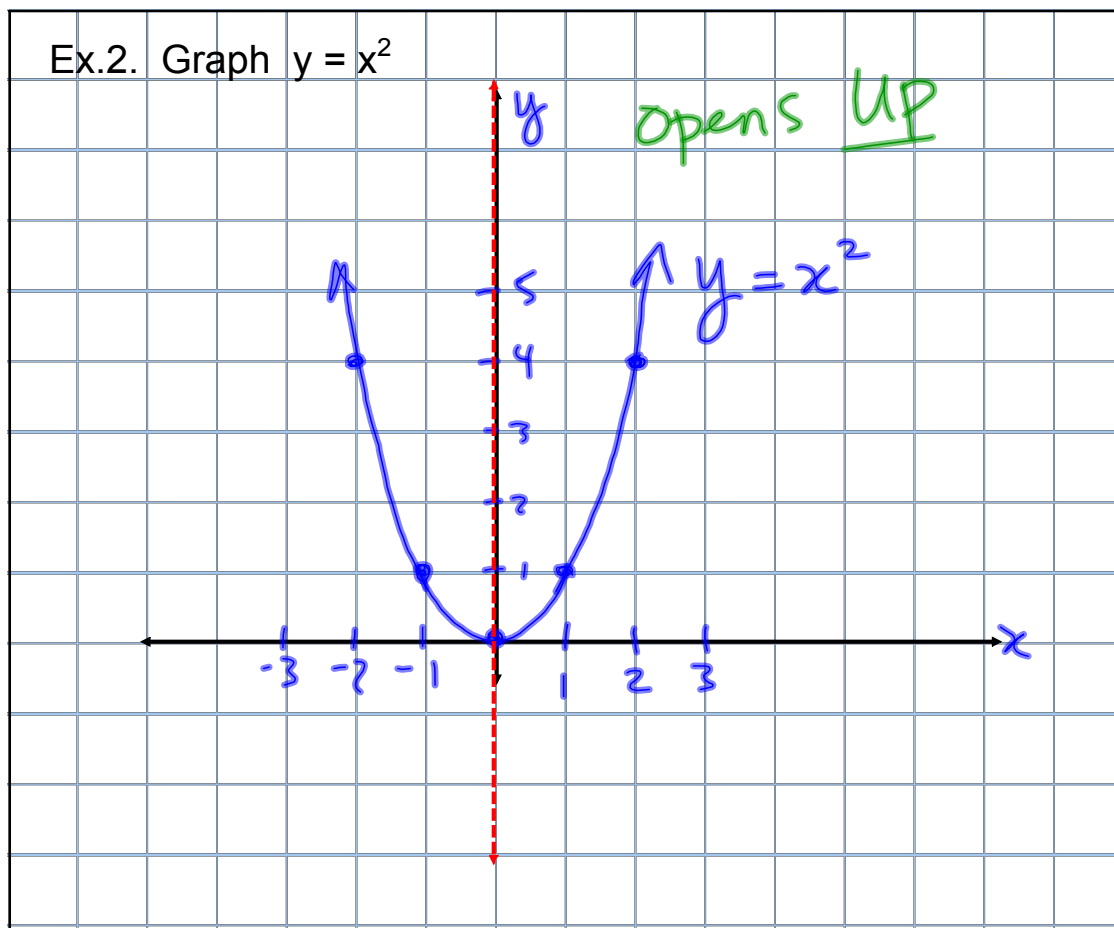
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Ex.1. Create a TOV for $y = x^2$

1st diff.   2nd diff

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

$\Delta^2 y$ is the change in Δy, or change in 1st differences.
$\Delta^2 y$ is the <u>second difference.</u>

In a quadratic relationship, first differences are ___different___
and second differences are ___the same___.

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2

Ex.2. Graph $y = x^2$

y

opens UP

$y = x^2$

-5

-4

-3

-2

-1

-3 -2 -1   1   2   3   *x*

Mar 31-8:51 AM

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

x	$y = -x^2 + 2x + 3$	Δy	Δ²y
-2	-5		
-1	0	0-(-5)=5	3-5=-2
0	3	3-0=3	1-3=-2
1	4	4-3=1	-1-1=-2
2	3	3-4=-1	

$y = -(-2)^2 + 2(-2) + 3$ $-(-1)^2 + 2(-1) + 3$
$= -(4) - 4 + 3$ $= -(1) - 2 + 3$
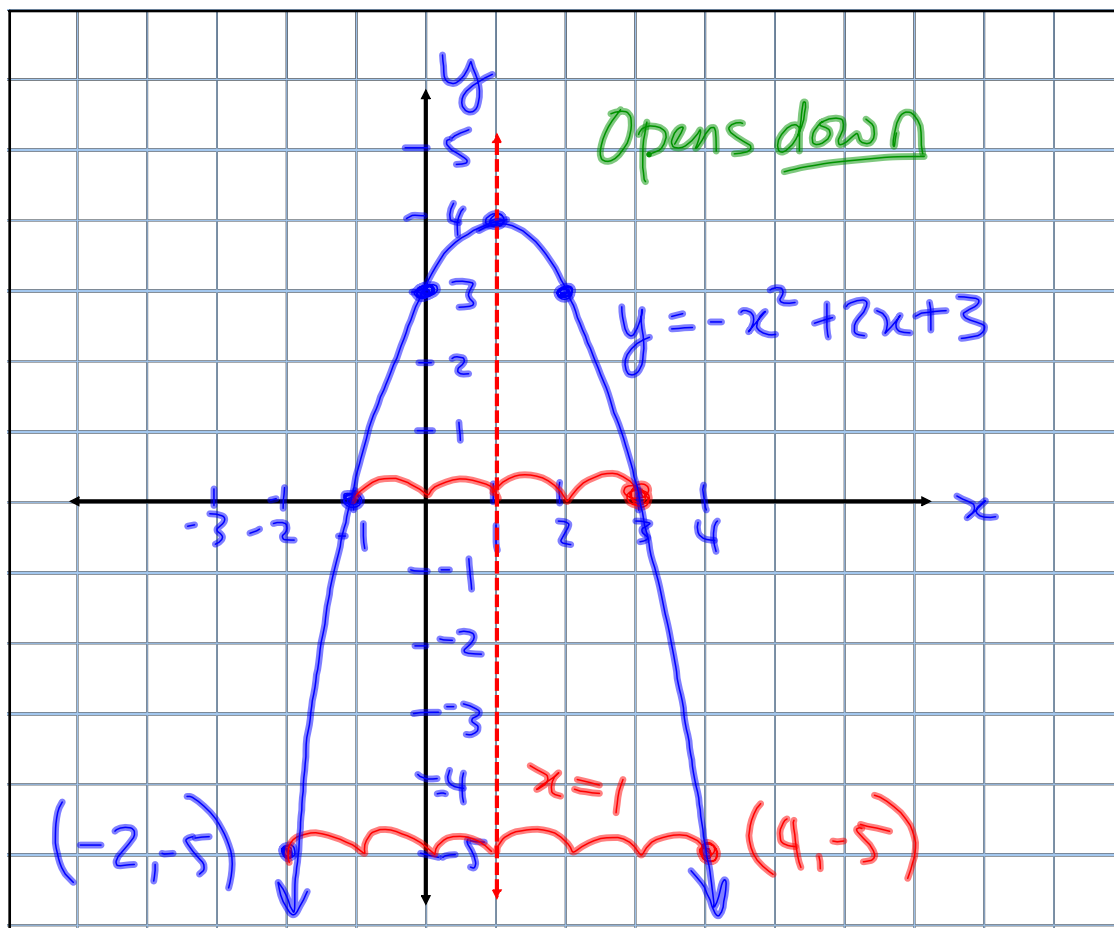$= -5$ $= 0$

$-(0)^2 + 2(0) + 3$ $-(1)^2 + 2(1) + 3$
$= 3$ $= -1 + 2 + 3$
                           $= 4$

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

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Opens down ∩

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

$x = 1$

$(-2, -5)$ $(4, -5)$

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

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

Positive "a" value
Positive 2nd difference $\Longrightarrow$ parabola opens <u>up</u>.

Negative "a" value
Negative 2nd difference $\Longrightarrow$ parabola opens <u>down</u>

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

Nov 1-8:01 AM

5 (a)

not linear   quadratic

x	y	Δy	$\Delta^2 y$
−3	2.5		
		2.5	
−2	5.0		−1.0
		1.5	
−1	6.5		−1.0
		0.5	
0	7.0		

opens down

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$$y = ax^2 + bx + c, \quad a \neq 0$$

What if $a = 0$?

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

$$= 0 + bx + c$$

$$y = bx + c$$

$$y = mx + b \quad \text{Straight line!}$$

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