Intro to Quadratic Relations

Apr. 15 / 2010

So far: LINEAR RELATIONS	New: QUADRATIC RELATIONS
Equation: $y = mx^1 + b$	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.

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Ex.1. Create a TOV for y = 2x + 1

x	y = 2x + 1	$\Delta y = y_2 - y_1$
-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 first difference.

In a linear relationship, the first differences are equal.

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Ex.2. Create a TOV for $y = x^2$

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 equal.

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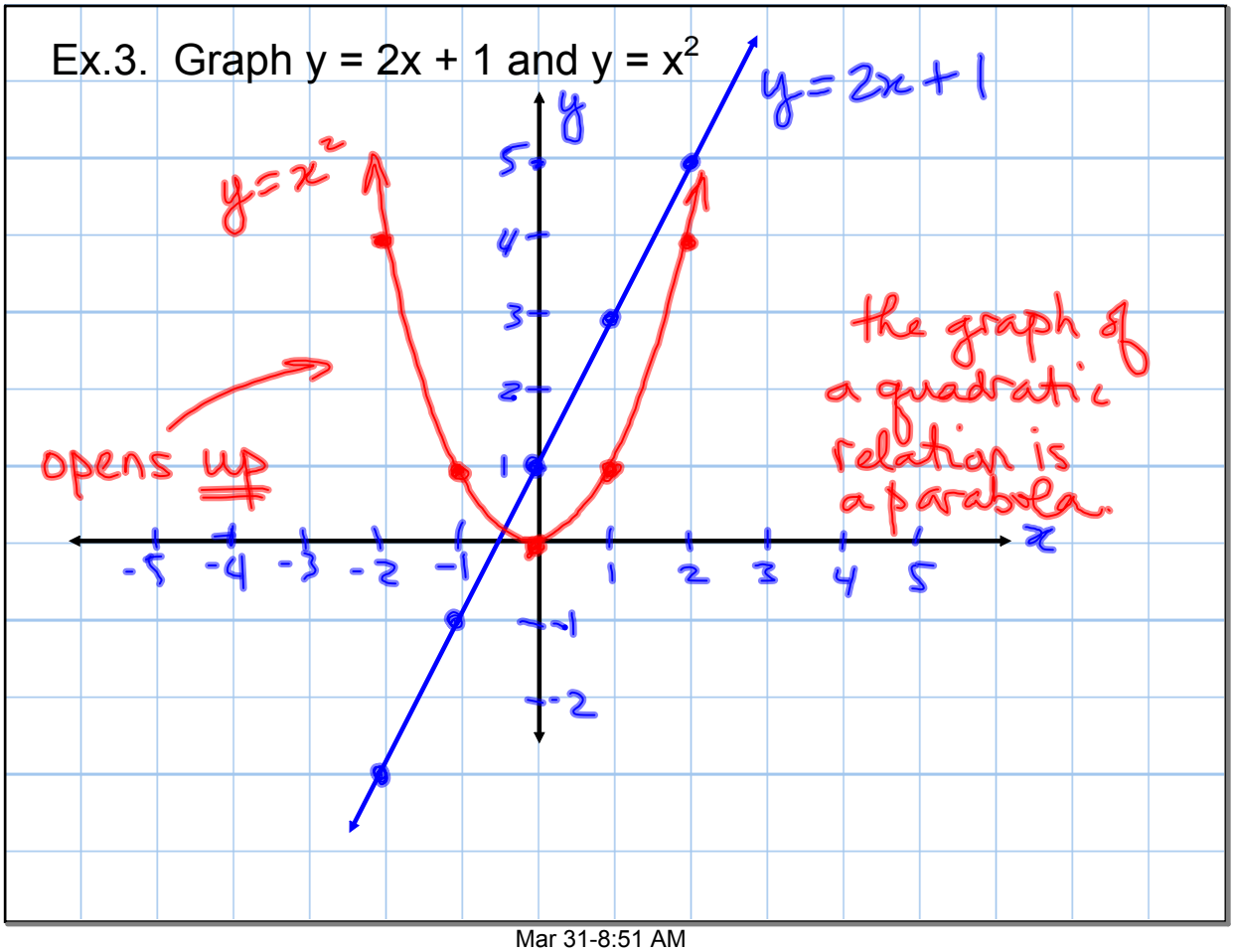
Ex.3. Graph $y = 2x + 1$ and $y = x^2$



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Ex.4. Create a TOV and graph $y = -x^2 + 2x + 3$.

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

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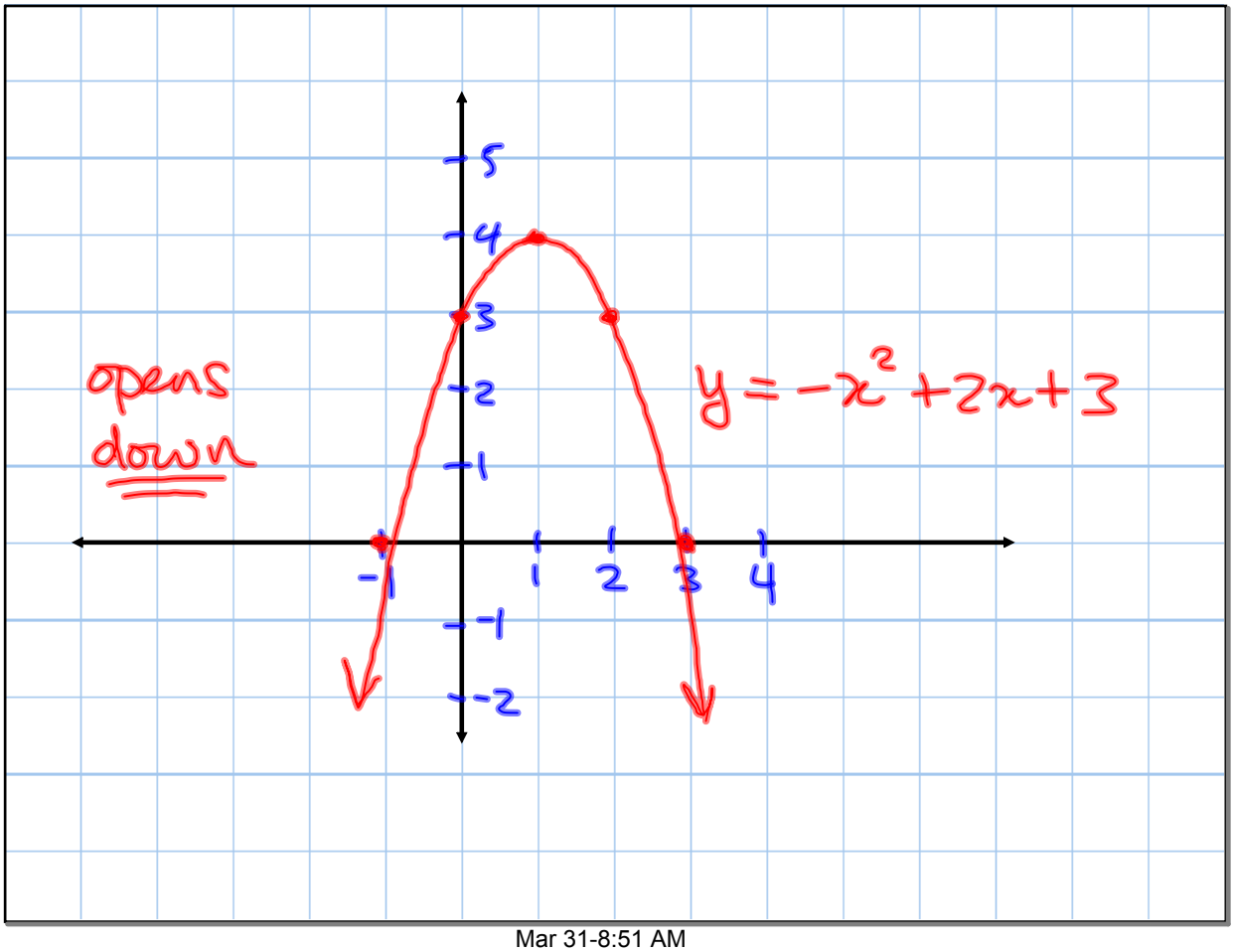

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The direction of opening of the parabola can be determined from the sign of the 2nd difference:

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

Negative 2nd difference $\Rightarrow$ parabola opens down.

Assigned Work:

p. 254 # 1 - 6, 8

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