Algebra 1

Chapter 9

Section 9-6

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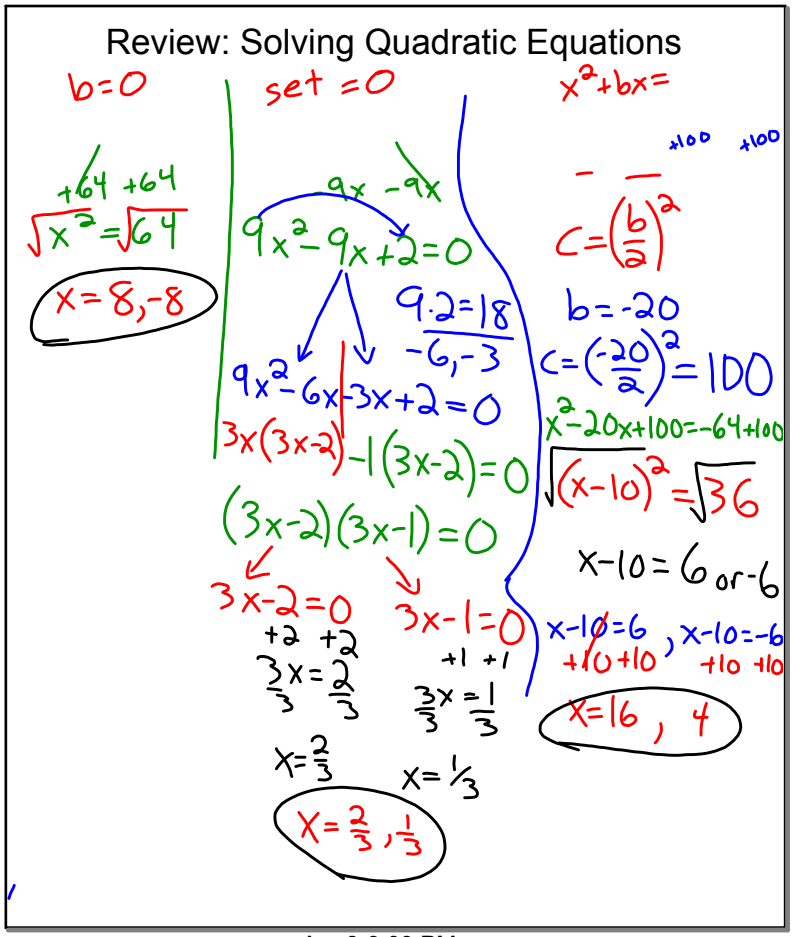
Review: Solving Quadratic Equations



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take note

Key Concept Quadratic Formula

Algebra

If $ax^2 + bx + c = 0$, and $a \neq 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example

Suppose $2x^2 + 3x - 5 = 0$. Then $a = 2$, $b = 3$, and $c = -5$. Therefore

$$x = \frac{-(3) \pm \sqrt{(3)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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Solve using the quadratic formula.

$$-3x^2 + 7x - 2 = 0$$

$a = -3$ $b = 7$ $c = -2$

$$\frac{-7 \pm \sqrt{(7)^2 - 4(-3)(-2)}}{2(-3)} = \frac{-7 \pm \sqrt{49 - 24}}{-6}$$

$$\frac{-7 \pm \sqrt{25}}{-6}$$

$$\frac{-7 + 5}{-6} = \frac{-2}{-6} = \frac{1}{3}$$

$$\frac{-7 - 5}{-6} = \frac{-12}{-6} = 2$$

$x = \frac{1}{3}, 2$

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Solve using the quadratic formula.

$20x^2 + 7x - 3 = 0$

$\frac{-7 \pm \sqrt{7^2 - 4(20)(-3)}}{2(20)} = \frac{-7 \pm \sqrt{49 + 240}}{40}$

$\frac{-7 \pm \sqrt{289}}{40} \rightarrow \frac{-7+17}{40} = \frac{10}{40} = \frac{1}{4}$

$\frac{-7-17}{40} = \frac{-24}{40} = \frac{-3}{5}$

$x = \frac{1}{4}, \frac{-3}{5}$

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Solve using the quadratic formula.

$a=5 \quad b=-8 \quad c=1$

$5x^2 - 8x + 1 = 0$

$\frac{-(-8) \pm \sqrt{(-8)^2 - 4(5)(1)}}{2(5)} = \frac{8 \pm \sqrt{64-20}}{10}$

$\frac{8 \pm \sqrt{44}}{10} \rightarrow \frac{8+\sqrt{44}}{10} \approx 1.46$

$\frac{8-\sqrt{44}}{10} \approx 0.14$

$x = 1.46, 0.14$

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Solve using the quadratic formula.

Could be done by factoring: $x^2 - x = 2$

$-2 \quad -2$

$x^2 - x - 2 = 0$

$(x-2)(x+1)=0$

$x-2=0 \qquad x+1=0$

$x=2 \qquad x=-1$

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Solve using the quadratic formula.

$x^2 - x = 2$

$-2 \quad -2$

$1x^2 - 1x - 2 = 0$

$a=1 \quad b=-1 \quad c=-2$

$$\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-2)}}{2(1)}$$

$$\frac{1 \pm \sqrt{1+8}}{2} = \frac{1+\sqrt{9}}{2} = \frac{1+3}{2} = \frac{4}{2} = 2$$

$$\frac{1-\sqrt{9}}{2} = \frac{1-3}{2} = \frac{-2}{2} = -1$$

$x = -1, 2$

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Solve using the quadratic formula.

$2x^2 - x = -4x^2 - 3$

$+4x^2 \quad +4x^2 \quad +3$

$6x^2 - x + 3 = 0$

$a=6 \quad b=-1 \quad c=3$

$\frac{-(-1) \pm \sqrt{(-1)^2 - 4(6)(3)}}{2(6)} = \frac{1 \pm \sqrt{1-72}}{12}$

$\frac{1 \pm \sqrt{-71}}{12}$ ← can't have neg √

no solution!

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Review: Square roots

$\sqrt{x^2} = \sqrt{49}$ $\quad x = 7, -7$

$\sqrt{x^2} = \sqrt{0}$ $\quad x = 0$

$\sqrt{x^2} = \sqrt{-4}$ $\quad$ no solution

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Discriminant: Expression under the radical of quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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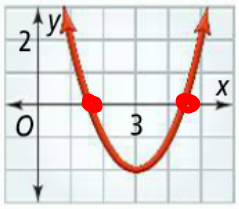
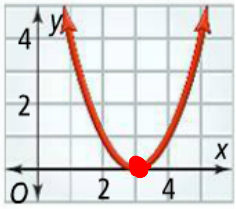
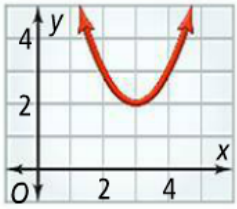
Discriminant	$b^2 - 4ac > 0$	$b^2 - 4ac = 0$	$b^2 - 4ac < 0$
Example	$x^2 - 6x + 7 = 0$ The discriminant is $(-6)^2 - 4(1)(7) = 8$, which is positive. 	$x^2 - 6x + 9 = 0$ The discriminant is $(-6)^2 - 4(1)(9) = 0$. 	$x^2 - 6x + 11 = 0$ The discriminant is $(-6)^2 - 4(1)(11) = -8$, which is negative. 
Number of Solutions	There are two real-number solutions.	There is one real-number solution.	There are no real-number solutions.

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Determine the number of real solutions for each quadratic equation.

b^2-4ac

$3x^2 + 4x + 13 = 0$

$a=3\ b=4\ c=13$

$4^2-4(3)(13)<0$

$16-156<0$

$-140<0$

no solution

$5x^2 - 20x + 20 = 0$

$a=5\ b=20\ c=20$

$(-20)^2-4(5)(20)$

$400-400=0$

1 solution

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