5.8 Quadratic Formula and Discriminant

A quadratic equation written in standard form $y = ax^2 + bx + c$ can be solved with the Quadratic Formula

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

Page 1

Solve each equation using the quadratic formula. Find the exact solutions. Then approximate any radical solutions. Round to the nearest hundredth.

$3x^2 - x = 4$

$$\overset{a}{3}x^2 - \overset{b}{x} - \overset{c}{4} = 0$$

$$x = \frac{+1 \pm \sqrt{1^2 - 4(3)(-4)}}{2(3)}$$

$$x = \frac{1 \pm \sqrt{1 + 48}}{6}$$

$$x = \frac{1 \pm \sqrt{49}}{6}$$

$$x = \frac{1+7}{6} \qquad x = \frac{1-7}{6}$$

$$x = \frac{4}{3} \qquad x = -1$$

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Solve each equation using the quadratic formula. Find the exact solutions. Then approximate any radical solutions. Round to the nearest hundredth.

$\overset{a}{3}x^2 + \overset{b}{23}x + \overset{c}{40} = 0$

$$x = \frac{-23 \pm \sqrt{23^2 - 4(3)(40)}}{2(3)} \qquad x = \frac{-23 \pm \sqrt{529 - 480}}{6}$$

$$x = \frac{-23 \pm \sqrt{49}}{6}$$

$$x = \frac{-23+7}{6} = \frac{-16}{6} = \frac{-8}{3}$$

$$x = \frac{-23-7}{6} = \frac{-30}{6} = -5$$

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Solve each equation using the quadratic formula. Find the exact solutions. Then approximate any radical solutions. Round to the nearest hundredth.

$3x^2 - 10x + 5 = 0$

$$x = \frac{10 \pm \sqrt{10^2 - 4(3)(5)}}{2(3)} \qquad x = \frac{10 \pm \sqrt{100 - 60}}{6}$$

$$x = \frac{10 \pm \sqrt{40}}{6} \qquad x = \frac{10 \pm 2\sqrt{10}}{6}$$

$$x = \frac{\overset{5}{\cancel{10}}}{\underset{3}{\cancel{6}}} \pm \frac{\overset{1}{\cancel{2}}\sqrt{10}}{\underset{3}{\cancel{6}}}$$

$$x = \frac{5}{3} \pm \frac{\sqrt{10}}{3}$$

40
2 20
2 10
2·5

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Sometimes the quadratic formula will give you complex solutions that you cannot find by graphing or factoring. Find the complex solutions.

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

$$-2x^2 - 4x - 3 = 0$$

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

$$x = \frac{4 \pm \sqrt{16 - 24}}{-4} \qquad x = \frac{4 \pm \sqrt{-8}}{-4} \qquad x = \frac{4 \pm 2i\sqrt{2}}{-4}$$

$$\frac{\cancel{4}^{1}}{\cancel{-4}_{-1}} \pm \frac{\cancel{2}^{1}i\sqrt{2}}{\cancel{-4}_{-2}} \qquad -1 \pm \frac{i\sqrt{2}}{-2}$$

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Sometimes the quadratic formula will give you complex solutions that you cannot find by graphing or factoring. Find the complex solutions.

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

Page 6

Sometimes the quadratic formula will give you complex solutions that you cannot find by graphing or factoring. Find the complex solutions.

$2x^2 + 8 = 7x$

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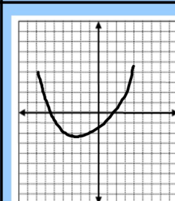
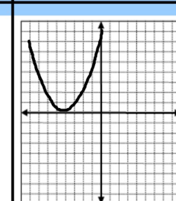
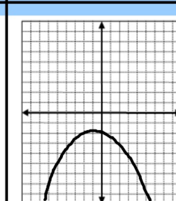
Quadratic equations can have real or complex solutions. You can determine the type and number of solutions by finding the discriminant. The discriminant of a quadratic equation in standard form is the value of the expression $b^2 - 4ac$

Value of discriminant:	positive	zero	negative
Types and number of solutions:	2 real	1 real	2 imaginary
Example of graphs:			

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Evaluate the discriminant of each equation. Tell how many solutions each equation has and whether the solutions are real or imaginary.

$x^2+6x+9=0$	$x^2+6x+10=0$	$x^2-4x-5=0$
$6^2-4(1)(9)$	$6^2-4(1)(10)$	$4^2-4(1)(-5)$
$36-36=0$	$36-40$	$16+20$
	-4	36
1 real	2 imag.	2 real

A player throws a ball up and toward a wall that is 17 feet high. The height h in feet of the ball t seconds after it leaves the player's hand is modeled by $h = -16t^2 + 25t + 6$. If the ball makes it to where the wall is, will it go over the wall or hit the wall?

$25^2 - 4(-16)(6)$

$625 +$

positive

go over wall

homework:

page 289 # 3-66 x 3 skip # 54, 57 and 60