WARM UP

1) Solve by taking the square root: $9x^2 - 64 = 0$

2) Solve by factoring: $x^2 - 8x + 12 = 0$

3) Solve by completing the square:
$x^2 - 6x + 17 = 0$

4) Solve by completing the square
(leave answer in simplified radical form):
$2x^2 + 10x - 8 = 0$

Nov 7-9:49 PM

Answers for Lesson 5-7 Exercises

1. $-4, -2$	**2.** $-8, 12$	**3.** $-1, 3$
4. $-\frac{16}{3}, -\frac{8}{3}$	**5.** $-4, 3$	**6.** $1, 11$
7. 81	**8.** $\frac{1}{4}$	**9.** 144
10. 100	**11.** $\frac{9}{4}$	**12.** 4
13. $-4, 7$	**14.** $-1, 4$	**15.** $-3 \pm 4i\sqrt{2}$
16. $1 \pm i$	**17.** $-1, 9$	**18.** $-3 \pm i\sqrt{13}$
19. $\pm 2i$	**20.** $-1 \pm 2i$	**21.** $1 \pm \sqrt{5}$
22. $\frac{3}{2} \pm \frac{i\sqrt{31}}{2}$	**23.** $2 \pm \frac{\sqrt{15}}{3}$	**24.** $-\frac{5}{4} \pm \frac{i\sqrt{3}}{4}$
25. $-4, \frac{7}{2}$	**26.** $\frac{2}{3} \pm \frac{1}{3}i$	**27.** $-\frac{3}{2}, \frac{1}{2}$

Oct 22-3:34 PM

(13) $x^2 - 3x = 28$

$\left(\frac{-3}{2}\right)^2$

$x^2 - 3x + \left(\frac{-3}{2}\right)^2 = \frac{28 \cdot 4}{4} + \frac{9}{4}$

$\left(x - \frac{3}{2}\right)^2 = \frac{112}{4} + \frac{9}{4}$

Oct 23-12:57 PM

$$\sqrt{\left(x-\frac{3}{2}\right)^2} = \pm\sqrt{\frac{121}{4}}$$

$$x-\frac{3}{2} = \pm\frac{11}{2}$$

$$x = \frac{3}{2} \pm \frac{11}{2}$$

$$x = 7 \text{ or } -4$$

Oct 23-1:01 PM

(13) $x^2 - 3x + \left(-\frac{3}{2}\right)^2 = 28 + \left(-\frac{3}{2}\right)^2$

$\frac{112}{4} + \frac{9}{4}$

$$\sqrt{\left(x-\frac{3}{2}\right)^2} = \pm\sqrt{\frac{121}{4}}$$

$$x-\frac{3}{2} = \pm\frac{11}{2}$$

Oct 23-11:19 AM

$$x-\frac{3}{2} = \pm\frac{11}{2}$$

$$x = \frac{3}{2} \pm \frac{11}{2}$$

$$x = -4 \text{ or } 7$$

Oct 23-10:35 AM

21 $6x - 3x^2 = -12$

$-3x^2 + 6x = -12$

$-3\left(x^2 - 2x + \left(\frac{-2}{2}\right)^2\right) = -12 + -3(1)$

$-3(x-1)^2 = -15$

Oct 23-1:06 PM

$\frac{-3(x-1)^2}{-3} = \frac{-15}{-3}$

$\sqrt{(x-1)^2} = \pm\sqrt{5}$

$x - 1 = \pm\sqrt{5}$

$x = 1 \pm \sqrt{5}$

Oct 23-1:09 PM

21 $6x - 3x^2 = -12$

$-3x^2 + 6x = -12$

$-3\left(x^2 - 2x + \left(\frac{-2}{2}\right)^2\right) = -12 + -3(1)$

$\frac{-3(x-1)^2}{-3} = \frac{-15}{-3}$

$\sqrt{(x-1)^2} = \pm\sqrt{5}$

$x = 1 \pm \sqrt{5}$

Oct 23-10:36 AM

30. $y = -2\left(x - \frac{3}{2}\right)^2 + \frac{11}{2}$

31. $y = (x + 2)^2 - 3$

32. $y = 2(x - 2)^2 - 7$

33. $y = -(x + 1)^2 + 4$

39. **a.** (59, 36.81)
b. 36.81 ft
c. 7.65 ft
d. about 120 ft
e. Answers may vary. Sample: The path is parabolic. Also, the linear model does not predict that the ball will eventually hit the ground.

$x = \frac{-b}{2a}$

plug in x to calc. y-value

Oct 22-3:35 PM

At this point you have learned how to solve quadratic equations by:

factoring
using square roots
graphing
completing the square

Many quadratic equations may be solved using these methods; however, some cannot be conveniently solved using any of these methods.

Today we will discuss a tool to solve ANY quadratic equation.

It ALWAYS works.

Finding Zeros: Quad Formula

5.8 The Quadratic Formula

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

Quadratic Formula Song

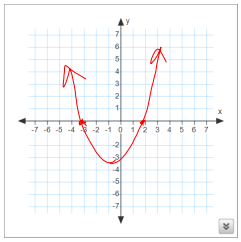
Nov 6-9:18 AM

Getting Started

The objective is to be able to solve any quadratic equation by using the quadratic formula.

Solving a Quadratic Equation means to find its:
solutions,
roots,
zero's,
x-intercepts

Looks like this:



Nov 6-9:18 AM

Example Problem 1

Use the quadratic formula to solve the following equation.

$x^2 - 6x + 7 = 0$ $\quad a = 1, \quad b = -6, \quad c = 7$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(7)}}{2(1)} = \frac{6 \pm \sqrt{36 - 28}}{2}$$

$$x = \frac{6 \pm \sqrt{8}}{2} = \frac{6 \pm 2\sqrt{2}}{2} = 3 \pm \sqrt{2}$$

$x = 3 \pm \sqrt{2}$ OR $x = 4.41$ or $x = 1.59$

Check your answer by graphing!

Nov 6-9:18 AM

Problem 1 $3x^2 + 4x + 10 = 0$

a = 3 b = 4 c = 10

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(3)(10)}}{2(3)}$$

$$x = \frac{-4 \pm \sqrt{16 - 120}}{6}$$

$$x = \frac{-4 \pm \sqrt{-104}}{6}$$

$$x = \frac{-4 \pm 2i\sqrt{26}}{6} = \frac{-2 \pm i\sqrt{26}}{3}$$

$x = \frac{-2 \pm \sqrt{26}\, i}{3}$

Check your answer by graphing!

Nov 6-9:18 AM

Problem 2

$2x^2 + 4x = 3$

a = b = c =

click here to reveal answer

Check your answer by graphing!

Nov 6-9:18 AM

Problem 3

Solve: $3x^2 - 8 = 0$

click here to reveal answer

Check your answer by graphing!

Nov 6-9:18 AM

How Many Solutions Will There Be?

To determine how many solutions the quadratic equation will have, determine the value of the discriminant.

Nov 7-9:49 PM

Discriminant - the part of the equation under the radical sign in a quadratic equation.

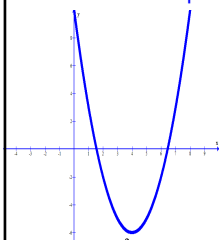
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$b^2 - 4ac$ is the discriminant

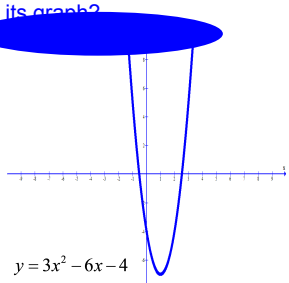
neg → no solution
pos → two solutions
zero → one solution

The Discriminant

[redacted] between the discriminant of a [redacted] and its graph?



$y = x^2 - 8x + 10$



$y = 3x^2 - 6x - 4$

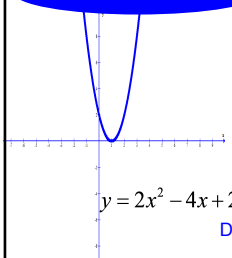
Discriminant

$(8)^2 - 4(1)(10) = 64 - 40 = 24$

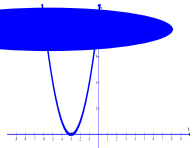
$(-6)^2 - 4(3)(-4) = 36 + 48 = 84$

The Discriminant

What is the relationship between the discriminant of a [redacted] and its graph?



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



$y = x^2 + 6x + 9$

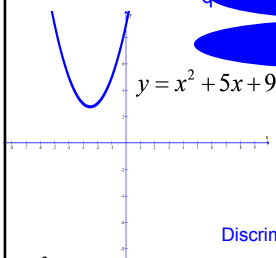
Discriminant

$(-4)^2 - 4(2)(2) = 16 - 16 = 0$

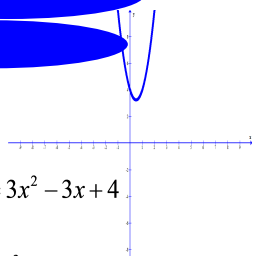
$(6)^2 - 4(1)(9) = 36 - 36 = 0$

The Discriminant

What is the relationship between the discriminant of a q



$y = x^2 + 5x + 9$



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

Discriminant

$(5)^2 - 4(1)(9) = 25 - 36 = -11$ $(-3)^2 - 4(3)(4) = 9 - 48 = -39$

The Discriminant

$ax^2 + bx + c = 0$

The discriminant, $b^2 - 4ac$, or the part of the equation under the radical sign, may be used to determine the number of real solutions there are to a quadratic equation.

If $b^2 - 4ac > 0$, the equation has two real solutions
If $b^2 - 4ac = 0$, the equation has one real solution
If $b^2 - 4ac < 0$, the equation has no real solutions but has two imaginary solutions

The Discriminant

HW 5.8

p. 293 3 - 39 by 3's,
57 - 59 all, 66, 68

Nov 9-2:38 PM

A Practice by Example

Solve each equation using the Quadratic Formula.

Example 1 (page 290) — GO for Help

1. $x^2 - 4x + 3 = 0$
2. $x^2 + 8x + 12 = 0$
3. $2x^2 + 5x - 7 = 0$
4. $3x^2 + 2x - 1 = 0$
5. $x^2 + 10x = -25$
6. $2x^2 + 3x - 5 = 0$
7. $x^2 = 3x - 1$
8. $x^2 + 6x - 5 = 0$
9. $3x^2 - 4x - 2 = 0$
10. $8x^2 - 2x - 3 = 0$
11. $x(x - 5) = -4$
12. $9x^2 + 12x - 5 = 0$

Example 2 (page 290)

13. $x^2 - 6x + 11 = 0$
14. $x^2 = 2x - 5$
15. $x^2 + 3x + 5 = 0$
16. $2x^2 + 8x + 12 = 0$
17. $x^2 - 2x + 3 = 0$
18. $3x^2 + 4x + 10 = 0$
19. $-x^2 + 5x - 7 = 0$
20. $2x^2 = 7x - 8$
21. $15x^2 + 2x + 1 = 0$

Example 3 (page 291)

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

22. $2x^2 - 5x - 3 = 0$
23. $3x^2 - 10x + 5 = 0$
24. $3x^2 + 4x - 3 = 0$
25. $6x^2 - 5x - 1 = 0$
26. $7x^2 - x - 12 = 0$
27. $5x^2 + 8x - 11 = 0$
28. $4x^2 + 4x = 22$
29. $2x^2 - 1 = 5x$
30. $2x^2 + x = \frac{1}{2}$

Examples 4 and 5 (page 292)

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

31. $x^2 + 4x + 5 = 0$
32. $x^2 - 4x - 5 = 0$
33. $4x^2 + 20x + 25 = 0$
34. $2x^2 + x + 28 = 0$
35. $2x^2 + 7x - 15 = 0$
36. $6x^2 - 2x + 5 = 0$
37. $2x^2 + 7x = -6$
38. $x^2 - 12x + 36 = 0$
39. $x^2 = 8x - 16$

Oct 22-3:50 PM

Without graphing, tell how many x-intercepts each function has.

57. $y = -2x^2 + 3x - 1$
58. $y = 0.25x^2 + 2x + 4$
59. $y = x^2 + 3x + 5$
60. $y = -x^2 + 3x + 10$
61. $y = 3x^2 - 10x + 6$
62. $y = 10x^2 + 13x - 3$

66. Use the discriminant to match each function with its graph.

a. $f(x) = x^2 - 4x + 2$ **b.** $f(x) = x^2 - 4x + 4$ **c.** $f(x) = x^2 - 4x + 6$

I.

II.

III.

68. **Physics** The equation $h = 80t - 16t^2$ models the height h feet reached in t seconds by an object propelled straight up from the ground.
a. Will the object ever reach a height of 90 ft?
b. Verify your answer to part (a) with a graph.
c. For what values of t will the object be in the air?

Oct 22-3:51 PM

1 What is value of the discriminant of
$2x^2 - 2x + 3 = 0$?

The Discriminant

2 Find the number of solutions using the discriminant for $2x^2 - 2x + 3 = 0$

A 2 imaginary

B 1 real

C 2 real

The Discriminant

3 What is value of the discriminant of $x^2 - 8x + 4 = 0$?

The Discriminant

Find the number of x-intercepts using the discriminant for $x^2 = 8x - 4$

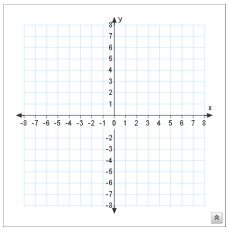
A 0

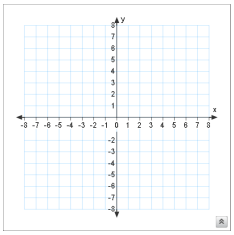
B 1

C 2

The Discriminant

State the sign of the discriminant of each graph.





Nov 7-9:52 PM