

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 222-223 # 1bed, 3, 6, 8  
f/b

## Today's Learning Goal(s):

By the end of the class, I will be able to:

- Determine how many roots a quadratic equation has without actually locating them.
- Define "discriminant".

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3. Use the quadratic formula to solve each quadratic real equation. Round

your answers to two decimal places. If there is no real solution, say so.

a) $x^2 - 5x + 11 = 0$	d) $4x^2 - 5x - 7 = 0$
b) $-2x^2 - 7x + 15 = 0$	e) $-3x^2 - 5x - 11 = 0$
c) $4x^2 - 44x + 121 = 0$	f) $-8x^2 + 5x + 2 = 0$

$$\alpha = -8 \quad b = 5 \quad c = 2$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(-8)(2)}}{2(-8)}$$

$$= \frac{-5 \pm \sqrt{25 + 64}}{-16}$$

$$= \frac{-5 \pm \sqrt{89}}{-16}$$

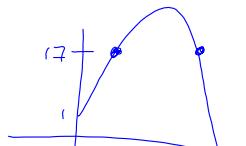
$$x = \frac{-5 + \sqrt{89}}{-16} \quad \text{or} \quad x = \frac{-5 - \sqrt{89}}{-16}$$

$$\approx -0.277$$

$$\approx -0.28$$

$$\approx 0.902$$

$$\approx 0.90$$



- p. 222 6. On Mars, if you hit a baseball, the height of the ball at time  $t$  would be modelled by the quadratic function  $h(t) = -1.85t^2 + 20t + 1$ , where  $t$  is in seconds and  $h(t)$  is in metres.

- a) When will the ball hit the ground?  
b) How long will the ball be above 17 m?

$$h(t) = 17 \quad \therefore 17 = -1.85t^2 + 20t + 1$$

$$0 = -1.85t^2 + 20t + 1 - 17$$

$$= -1.85t^2 + 20t - 16$$

$$\alpha = -1.85 \quad b = 20 \quad c = -16$$

$$t = \frac{-20 \pm \sqrt{20^2 - 4(-1.85)(-16)}}{2(-1.85)}$$

$$= \frac{-20 \pm \sqrt{281.6}}{-3.7}$$

$$t = \frac{-20 + \sqrt{281.6}}{-3.7} \quad \text{or} \quad t = \frac{-20 - \sqrt{281.6}}{-3.7}$$

$$\approx 0.870$$

$$\approx 9.940$$

$$\approx 0.87$$

$$\approx 9.94$$

$$\text{How long} = \Delta t$$

$$\approx 9.94 - 0.87$$

$$\approx 9.07 \text{ sec.}$$

**4.4 Investigating the Nature of the Roots**

Date: April 1/19

Recall: The quadratic formula allows us to find the roots,  $x$ , of a quadratic equation,  $ax^2 + bx + c = 0$ 

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

The expression  $b^2 - 4ac$  is the part under the square root sign and is called the "discriminant". It allows us to determine the "nature of the roots" (number of roots and the type of root).

$b^2 - 4ac > 0 \Rightarrow$  two distinct real solutions (roots) (and 2  $x$ -intercepts)

$b^2 - 4ac = 0 \Rightarrow$  one real solution (root) (and 1  $x$ -intercept)

$b^2 - 4ac < 0 \Rightarrow$  no real solution (roots) (and no  $x$ -intercepts)

Ex. 1: Write the discriminant. Do not evaluate.

a)  $x^2 + 11x = 6x^2 - 17$

$x^2 - 6x^2 + 11x + 17 = 0$

$a = -5$

$b = 11$

$c = 17$

b)  $(x+3)(2x-1) = 4(x+2)$

$2x^2 - x + 6x - 3 = 4x + 8$

$2x^2 + 5x - 3 - 4x - 8 = 0$

$2x^2 + x - 11 = 0$

$a = 2 \quad b = 1 \quad c = -11$

$b^2 - 4ac$

$= (11)^2 - 4(-5)(17)$

$= 121 + 340$

$= 461$

$b^2 - 4ac$

$= (1)^2 - 4(2)(-11)$

$= 89$

Ex. 2: Determine the number of solutions of each quadratic equation. Do not solve.

a)  $2x^2 + 4x - 9 = 0$

$b^2 - 4ac$

$= (4)^2 - 4(2)(-9)$

$= 16 + 72$

$= 88$

b)  $2x^2 - 3x + 8 = 0$

$b^2 - 4ac$

$= (-3)^2 - 4(2)(8)$

$= -55$

$a = 4 \quad b = -12 \quad c = 9$

c)  $4x^2 - 8x = 4x - 9$

$4x^2 - 8x - 4x + 9 = 0$

$4x^2 - 12x + 9 = 0$

$= (-12)^2 - 4(4)(9)$

$= 144 - 144$

$b^2 - 4ac > 0$

2 distinct  
real solutions

$b^2 - 4ac < 0$

No real solutions

$b^2 - 4ac = 0$

One real root

Ex. 3: For what value of  $m$  does  $g(x) = 49x^2 - 28x + m$  have no (real) zeros?

\* You must start with condition given

$a = 49$

$b^2 - 4ac < 0$

$b = -28$

$(-28)^2 - 4(49)(m) < 0$

$c = m$

$784 - 196m < 0$

$784 < 196m$

$\frac{784}{196} < m$

$4 < m$

$-196m < -784$

$m > \frac{-784}{-196} \quad * \text{ Mult/Div}$

by negative

reverse

the inequality

**Today's Homework:** pp. 232-233 # 1ac, 2abc, 5, 7, 8a, 11

*Work ahead on Mid-chapter Review: p. 226 # 8 – 11*

**Rule Review:**

$$-2x < -8$$

$$2x < -8$$

$$-2x < 8$$

$$x > \frac{-8}{-2}$$

$$x < \frac{-8}{2}$$

$$x > \frac{8}{-2}$$

$$x > 4$$

$$x < -4$$

$$x > -4$$