

Name (Last, First): DUE THURS 5/16

Period: 2 Date: 5/13/19

9.5: Solving Quadratic Equations Using the Quadratic Formula

Write out the standard equation, vertex and intercept for a quadratic equation:

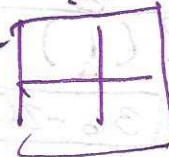
STANDARD
INTERCEPT

$$Ax^2 + Bx + C$$

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

$$\frac{A}{B}$$

$$\frac{A \cdot C}{+} = B$$



$$A(x-p)(x-q)$$

$$\frac{p+q}{2}$$

Vertex

$$A(x-h)^2 + k$$

$$Ax^2 + bx + c$$

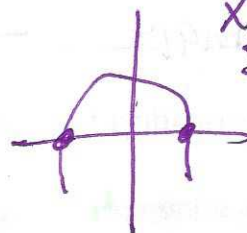
Using the Quadratic Formula: From the Standard form ($ax^2 + bx + c = 0$) you

can use the quadratic formula $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to solve for the ROOTS

(x-intercepts) for the parabola.

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

X-intercepts
Solutions



Example 1 - Using the Quadratic Formula:

Solve the equation: $2x^2 - 5x + 3 = 0$ (using the quadratic formula)

1) Determine the a, b, & c values of the equation:

- a) 2
- b) -5
- c) 3

2) Substitute the a, b & c values of the equation into the quadratic formula:

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

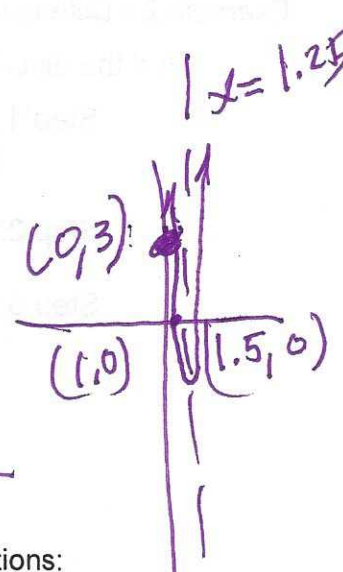
3) Solve the quadratic formula:

$$\frac{5 \pm \sqrt{25 - 24}}{4}$$

4) Substitute the values for x into the original quadratic equation to check the solutions:

$$\frac{5 \pm 1}{4} = \frac{5 \pm 1}{4}$$

$$\left(\frac{3}{2}, 0\right) \quad \frac{5+1}{4} = \frac{6}{4} = \frac{3}{2} \quad \frac{5-1}{4} = \frac{4}{4} = 1 \quad (1, 0)$$



Your Turn: Solve the equation using square roots:

1) $x^2 - 6x + 5 = 0$

A: 1 B: -6 C: 5

$$\frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(5)}}{2(1)}$$

$$\frac{6 \pm \sqrt{36 - 20}}{2}$$

$$\frac{6 \pm \sqrt{16}}{2}$$

$$\frac{6+4}{2}$$

$$\frac{6-4}{2}$$

$x=5$
(5,0)

$$\frac{6-4}{2} = \frac{2}{2}$$

$x=1$ (1,0)

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

A) -3 B) 2 C) 7

$$\frac{-2 \pm \sqrt{2^2 - 4(-3)(7)}}{2(-3)}$$

$$\frac{-2 \pm \sqrt{4 + 84}}{-6}$$

$$\frac{-2 \pm \sqrt{88}}{-6}$$

$$\frac{-2 \pm 2\sqrt{22}}{-6}$$

3) $4x^2 - 4x = -1$

$4x^2 - 4x + 1 = 0$

A) 4 B) -4 C) 1

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

$$\frac{4 \pm \sqrt{16 - 16}}{8}$$

$$\frac{4 \pm \sqrt{0}}{8}$$

$\frac{4}{8}$ or $\frac{1}{2}$

Interpreting the Discriminant: From the quadratic formula

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

you can determine the number of solutions an equation has by the

discriminant $\sqrt{b^2 - 4ac}$

$$\sqrt{-4}$$

Core Concept: Interpreting the Discriminant

→ two real solutions
• two x-intercepts

$$b^2 - 4ac > 0$$

→ one real solution
• one x-intercept

$$b^2 - 4ac = 0$$

• no real solutions
• no x-intercepts

$$b^2 - 4ac < 0$$

Example 2 – Determining the Number of Real Solutions using the Discriminant

Find the discriminant of the equation $x^2 + 8x - 3 = 0$

Step 1: Find values of a, b and c:

A: 1

B: 8

C: -3

Step 2: Substitute the values into the equation:

Step 3: Simplify the equation:

$$(8)^2 - 4(1)(-3)$$

$$64 + 12$$

76 → 2 solutions

$$-b \pm \sqrt{76}$$

Your Turn: Determine the number of solutions:

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

A: -1 B 4 C -4

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

$$\sqrt{16 - 16}$$

$$\sqrt{0}$$

1 solution

5) $6x^2 + 2x = -1$

A 6 B 2 C 1

$$\sqrt{(2)^2 - 4(6)(1)}$$

$$\sqrt{4 - 24}$$

$$\sqrt{-20}$$

NO SOLUTION

6) $\frac{1}{2}x^2 = 7x - 1$

A -.5 B 7 C -1



$$\sqrt{(7)^2 - 4(-.5)(-1)}$$

$$\sqrt{49 - 2}$$

$$\sqrt{47}$$

2 solutions

Core Concept: Selecting a Method to Solve a Quadratic equation:

Method	Advantages	Disadvantages
Factoring: <i>straight</i>	$Ax^2 + Bx + C$ A B C A·C B 	DOES NOT ALWAYS WORK
Graphing: $Ax^2 + Bx + C$ $x = \frac{-b}{2a}$ 	- SEE SOLUTION - ESTIMATES ROOTS - USES A GRAPH	- NOT ALWAYS ACCURATE - DIFFICULT TO GRAPH AT TIMES - LOT OF A WORK
Using Square Roots: $\sqrt{x^2} = \sqrt{16}$ $\sqrt{(x+4)^2} = \sqrt{49}$	BEST USED WHEN A=1 & NO B VALUE	- SOMETIMES DIFFICULT TO CALC.
Completing the Square $x^2 + 14x + (\frac{14}{2})^2$	BEST USED WITH NO C VALUE OR WHEN C DOES NOT FACTOR	
Quadratic Formula	FANTASTIC CAN ALWAYS FIND SOLUTION	

(EVEN IF IT IS NO SOLUTION)

9.5 Practice Questions

Solve using the quadratic formula (see example 1):

1) $x^2 - 12x + 36 = 0$

2) $x^2 + 7x + 16 = 0$

3) $9x^2 - 6x + 1 = 0$

4) $x^2 + 2x = 9$

5) $5x^2 - 2 = 4x$

6) $8x^2 + 8 = 6 - 9x$

Find the Discriminant of each quadratic equation:

7) $-x^2 - 20x + 5 = 30$

8) $2x^2 - 14x + 10 = 0$

9) $4x^2 + 12x - 15 = 5$

10) $y = x^2 - 4x - 2$

11) $y = x^2 + 6x + 10$

12) $y = -x^2 - 10x - 30$