4.8 – Solve using the Quadratic Formula

The Quadratic Formula is: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ where a, b, and c come from the general form of a quadratic: $ax^2 + bx + c = 0$

The DISCRIMINANT ($b^2 - 4ac$) will tell me what kind and how many answers to expect.

*** If the discriminant is *greater than zero* – there will be TWO REAL SOLUTIONS

*** If the discriminant is less then zero – there will be TWO IMAGINARY SOLUTIONS

*** If the discriminant is equal to zero – there will be ONE REAL SOLUTION

Example 1 Solve $x^2 + 3x = 2$

Step 1: Identify a, b, and c $a = 1$ $b = 3$ $c = -2$

Step 2: Apply the discriminant $b^2 - 4ac \rightarrow 9 + 8 = 17$ TWO REAL

Step 3: Apply the quadratic formula

$$x = \frac{-3 \pm \sqrt{17}}{2} = \begin{cases} \frac{-3+\sqrt{17}}{2} = .562 \\ \frac{-3-\sqrt{17}}{2} = -3.562 \end{cases}$$

Example 1 Solve $25x^2 - 18x = 12x - 9$

$a = 25$ $b = -30$ $c = 9$ $(-30)^2 - 4(25)(9) = 0$

ONE REAL

$$x = \frac{30}{50} = \boxed{\frac{3}{5}}$$

Example 3 Solve $-x^2 + 4x = 5$ $a=-1$ $b=4$ $c=-5$

$-5 \quad -5$

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

$b^2 - 4ac = 4^2 - 4(-1)(-5) = 16 - 20 = -4$

TWO IMAGINARY

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

(3 - 11).

EXAMPLES 1, 2, and 3 on pp. 292–293 for Exs. 3–30

EQUATIONS IN STANDARD FORM **Use the quadratic formula to solve the equation.**

3. $x^2 - 4x - 5 = 0$
4. $x^2 - 6x + 7 = 0$
5. $t^2 + 8t + 19 = 0$
6. $x^2 - 16x + 7 = 0$
7. $8w^2 - 8w + 2 = 0$
8. $5p^2 - 10p + 24 = 0$
9. $4x^2 - 8x + 1 = 0$
10. $6u^2 + 4u + 11 = 0$
11. $3r^2 - 8r - 9 = 0$

12. ★ **MULTIPLE CHOICE** What are the complex solutions of the equation $2x^2 - 16x + 50 = 0$?

Ⓐ $4 + 3i, 4 - 3i$ Ⓑ $4 + 12i, 4 - 12i$

Ⓒ $16 + 3i, 16 - 3i$ Ⓓ $16 + 12i, 16 - 12i$

EQUATIONS NOT IN STANDARD FORM **Use the quadratic formula to solve the equation.**

13. $3w^2 - 12w = -12$
14. $x^2 + 6x = -15$
15. $s^2 = -14 - 3s$
16. $-3y^2 = 6y - 10$
17. $3 - 8v - 5v^2 = 2v$
18. $7x - 5 + 12x^2 = -3x$
19. $4x^2 + 3 = x^2 - 7x$
20. $6 - 2t^2 = 9t + 15$
21. $4 + 9n - 3n^2 = 2 - n$

SOLVING USING TWO METHODS **Solve the equation using the quadratic formula. Then solve the equation by factoring to check your solution(s).**

22. $z^2 + 15z + 24 = -32$
23. $x^2 - 5x + 10 = 4$
24. $m^2 + 5m - 99 = 3m$
25. $s^2 - s - 3 = s$
26. $r^2 - 4r + 8 = 5r$
27. $3x^2 + 7x - 24 = 13x$
28. $45x^2 + 57x + 1 = 5$
29. $5p^2 + 40p + 100 = 25$
30. $9n^2 - 42n - 162 = 21n$