

10-3 Solving Quadratic Equations

Just like with linear equations, there are rules for solving **quadratic equations**. A quadratic equation is an equation that can be written in the form:

$$ax^2 + bx + c = 0$$

* It turns out that the **solution(s)** to a quadratic equation is/are the **roots or zeros** of the quadratic function. *

To solve quadratic equations, we will use a property that makes a lot of sense.

Zero Product Property

For every real number a and b . If $ab = 0$, then $a = 0$ or $b = 0$.

Example: If $(x+3)(x+2) = 0$, then $x+3=0$ or $x+2=0$

$$\begin{array}{cc} -3 & -2 \\ \hline x = -3 & x = -2 \end{array}$$

Let's use the Zero Product Property and solve for x .

$(x+7)(x-4) = 0$ $x+7=0$ $-7 \quad -7$ $x = -7$ $x-4=0$ $+4 \quad +4$ $x = 4$	$(3x-5)(4x-2) = 0$ $3x-5=0$ $+5 \quad +5$ $3x = 5$ $\frac{3x}{3} = \frac{5}{3}$ $x = \frac{5}{3}$ $4x-2=0$ $+2 \quad +2$ $4x = 2$ $x = \frac{2}{4} \text{ or } \frac{1}{2}$
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Now we connect the Zero Product Property to solving quadratic equations.

Factor the Trinomial	Difference of Perfect Squares	GCF
$x^2 - 2x - 15 = 0$ $1, 15$ $3, 5$ $(x-5)(x+3) = 0$ $x-5=0$ $+5 \quad +5$ $x = 5$ $x+3=0$ $-3 \quad -3$ $x = -3$ $(1) = 0$	$x^2 - 49 = 0$ $(x-7)(x+7) = 0$ $x-7=0$ $+7 \quad +7$ $x = 7$ $x+7=0$ $-7 \quad -7$ $x = -7$	$x^2 + 4x = 0$ $x(x+4) = 0$ $x = 0$ $x+4=0$ $-4 \quad -4$ $x = -4$

(2) x^2 is positive

Examples:

1. $x^2 + 11x + 18 = 0$

1, 18
2, 9
3, 6

$$(x + 9)(x + 2) = 0$$

$$x + 9 = 0$$

$$-9 \quad -9$$

$$x = -9$$

$$x + 2 = 0$$

$$-2 \quad -2$$

$$x = -2$$

3. $x^2 - 25 = 0$

$$(x + 5)(x - 5) = 0$$

$$x + 5 = 0$$

$$-5 \quad -5$$

$$x = -5$$

$$x - 5 = 0$$

$$+5 \quad +5$$

$$x = 5$$

5. $2x^2 - 14x = 0$

$$2x(x - 7) = 0$$

$$2x = 0$$

$$\frac{2}{2} \quad \frac{2}{2}$$

$$x = 0$$

$$x - 7 = 0$$

$$+7 \quad +7$$

$$x = 7$$

7. $x^2 + 8x = -15$

$$+15 \quad +15$$

$$x^2 + 8x + 15 = 0$$

$$(x + 3)(x + 5) = 0$$

$$x + 3 = 0$$

$$-3 \quad -3$$

$$x = -3$$

$$x + 5 = 0$$

$$-5 \quad -5$$

$$x = -5$$

2. $2x^2 + 8x - 64 = 0$

$$2(x^2 + 4x - 32) = 0$$

$$\frac{1}{2}(x - 4)(x + 8) = 0$$

$$2(x - 4)(x + 8) = 0$$

$$x - 4 = 0 \quad x + 8 = 0$$

$$x = 4 \quad x = -8$$

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

$$4(x^2 - 1) = 0$$

$$4(x - 1)(x + 1) = 0$$

$$x - 1 = 0 \quad x + 1 = 0$$

$$x = 1 \quad x = -1$$

Cubic Equation!!

6. $x^3 + 7x^2 + 12x = 0$

$$x(x^2 + 7x + 12) = 0$$

$$x(x + 3)(x + 4) = 0$$

$$x = 0$$

$$x + 3 = 0$$

$$-3 \quad -3$$

$$x = -3$$

$$x + 4 = 0$$

$$-4 \quad -4$$

$$x = -4$$

8. $2x^2 - 8x - 12 = -2x + 8$

$$2x^2 - 8x - 20 = -2x + 8$$

$$2x^2 - 6x - 20 = 0$$

$$2(x^2 - 3x - 10) = 0$$

$$2(x - 5)(x + 2) = 0$$

$$x - 5 = 0 \quad x + 2 = 0$$

$$x = 5 \quad x = -2$$

-32

1, 32

2, 16

4, 8

12

1, 12

3, 4

2, 6

Solving Quadratic Equations Practice

Name _____

1. $x^2 - x - 42 = 0$

2. $3x^2 + 3x - 18 = 0$

3. $x^2 - 81 = 0$

4. $4x^2 - 64 = 0$

5. $6x^2 + 12x = 0$

Cubic Equation!!

6. $x^3 + 5x^2 + 14x = 0$

7. $x^2 + 15x + 20 = 6x$

8. $-4x^2 - 8x - 3 = -3 - 5x^2$