

Solving Quadratic Equations

Techniques for solving quadratic equations

- ✓ **Graphing**
- ✓ **factor and use the zero product property**
- ✓ **Square root method**
- ✓ **completing the square**
- ✓ **quadratic formula**

● Solving equations **graphically**

- Procedure:
- Set equation = to 0
- Graph $y_1 = f(x)$ and $y_2 = 0$
- Graph such that $f(x)$ crosses the x-axis
- Calculate INTERSECTION to find the x-int

● **Factor** then set each factor = 0 and solve (always check your solution)

- Ex. $15x^2 = 5x$
 $15x^2 - 5x = 0$
 $5x(3x - 1) = 0$
 $5x = 0$ and $3x - 1 = 0$
 $x = 0$ and $x = 1/3$ *check by graphing
- **Student practice** $16^{x^2} - 8x + 1 = 0$ $3x^2 + 5x + 2 = 0$

● **Extract a square root** using

- Square Root property: radicalize-radicalize - \pm
- Ex. $4x^2 = 17$
 $x^2 = \frac{17}{4}$
 $x = \pm \sqrt{\frac{17}{4}} = \pm \frac{\sqrt{17}}{2}$
- **Student practice :** $5(x - 4)^2 = 45$
- $(x - 2)^2 = 8$
 $\sqrt{(x - 2)^2} = \pm\sqrt{8}$
 $x - 2 = \pm 2\sqrt{2}$
 $x = 2 \pm 2\sqrt{2}$

● **Complete the Square**

- **Procedure** $ax^2 + bx + c = 0$:
 1. Divide by a and format $x^2 + bx + \underline{\quad} = c + \underline{\quad}$
 2. Bring down x, bring down the sign, bring down $b/2$, ()²
 3. Square $b/2$ and **put in both blanks**
 4. Simplify the right side
 5. Radicalize-radicalize-± and then solve

- Ex. $x^2 - 6x + 3 = 0$ (notice $a = 1$ and b is an even number)

$$x^2 - 6x + \underline{36} = 3 + \underline{36}$$

$$(x - 6)^2 = 39$$

$$\sqrt{(x - 6)^2} = \pm\sqrt{39}$$

$$X = 6 \pm \sqrt{39}$$

- **Student Practice:** Solve by completing the square

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

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

● **Quadratic Formula:**

Given $ax^2 + bx + c = 0$ solve for x using:

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

- Ex. $x^2 + 10x = 8$
 $x^2 + 10x - 8 = 0$

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$$x = \frac{-10 \pm \sqrt{10^2 - 4 \cdot 1 \cdot (-8)}}{2(1)}$$

(now simplify)

- **Student Practice:** $3x - 16 = -2x^2$

Discriminant

Discriminant	Number	Type
0	1	rational root
perfect square	2	rational roots
non-perfect square	2	irrational roots
negative number	2	imaginary root

- Ex. Use the discriminant to determine the type of root: $3x^2 - 5x + 3 = 0$