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

• Factor then set each factor = 0 and solve
  (always check your solution)
  o Ex. \( 15x^2 = 5x \)
    \[
    15x^2 - 5x = 0 \\
    5x(3x - 1) = 0 \\
    5x = 0 \quad \text{and} \quad 3x - 1 = 0 \\
    x = 0 \quad \text{and} \quad x = \frac{1}{3} \quad \text{*check by graphing}
    \]
  o Student practice \( 16x^2 - 8x + 1 = 0 \) \( 3x^2 + 5x + 2 = 0 \)

• Extract a square root using
  o Square Root property: radicalize-radicalize - +
  o Ex. \( 4x^2 = 17 \)
    \[
    x^2 = \frac{17}{4} \\
    x = \pm \sqrt{\frac{17}{4}} = \pm \frac{\sqrt{17}}{2}
    \]
    \[
    (x - 2)^2 = 8 \\
    \sqrt{(x - 2)^2} = \pm\sqrt{8} \\
    x - 2 = \pm2\sqrt{2} \\
    x = 2 \pm 2\sqrt{2}
    \]
  o Student practice : \( 5(x - 4)^2 = 45 \)
Complete the Square

Procedure \( ax^2 + bx + c = 0 \):

1. Divide by \( a \) and format \( x^2 + bx + \_ = c + \_ \)
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-+ and then solve

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

\[
\begin{align*}
\quad & x^2 - 6x + \underline{36} = 3 + \underline{36} \\
\quad & (x - 6)^2 = 39 \\
\quad & \sqrt{(x - 6)^2} = \pm\sqrt{39} \\
\quad & X = 6 \pm \sqrt{39}
\end{align*}
\]

Student Practice: Solve by completing the square

\[
\begin{align*}
\quad & x^2 - 3 = 4x \\
\quad & x^2 + 3x - 5 = 0
\end{align*}
\]