8.1 Solving Quadratic Equations by completing the Square

(Lecture Notes, pp. 141-144)

Quadratic Equation

8.1.1 Give an example of a quadratic equation

\[ 4x^2 + \frac{3}{4}x + 3 = 0 \]

Then give an example that is not a quadratic equation

\[ 0x^2 + 4x - \frac{1}{5} \leq 0 \]

\[ 3x^2 + 4x + 5 \]

Using the square root property to solve equation:

8.1.2 Apply the square root property

(A) \((4x + 9)^2 = 5\)

\[ x = c \]

\[ x = \pm \sqrt{c} \]

\[ 4x + 9 = \pm \sqrt{5} \]
8.1 Solving Quadratic Equations by completing the Square

(Lecture Notes, pp. 141-144)

**Quadratic Equation**

8.1.1 Give an example of a quadratic equation

\[ 4x^2 + \frac{3}{4} x + -\pi = 0 \]

\[-3 + x = 4x^2 \]

Then give an example that is not a quadratic equation

\[ 0x^2 + 4x - \frac{1}{5} = 0 \]

\[ 3x^2 + 4x + 5 \]

Using the square root property to solve equations

8.1.2 Apply the square root property

(a) \((4x+9)^5 = 5\)

\[ x = c \]

\[ x = \pm \sqrt{c} \]

\[ 4x+9 = \pm \sqrt{5} \]
(b) \((3y)^2 = 0\)
\[
3y = \pm \sqrt{0}
\]
\[
y = \pm 0
\]

(c) \((9z - 2)^2 = -4\)
\[
9z - 2 = \pm \sqrt{-4}
\]
\[
z = \frac{2 \pm \sqrt{-4}}{9}
\]

17. \((8x - 5)^2 = -49\)
\[
8x - 5 = \pm \sqrt{-49} \quad \text{(Applying the Square Root Property)}
\]
\[
8x - 5 = \pm 7i \quad \text{Goal: get variable alone}
\]
\[
8x - 5 + 5 = 5 \pm 7i
\]
\[
8x = 5 \pm 7i
\]
\[
\frac{8x}{8} = \frac{5 \pm 7i}{8}
\]
\[
x = \frac{5}{8} \pm \frac{7i}{8}
\]

46. \(s(t) = \text{distance in feet}\)
\(t = \text{time in seconds}\)
\[
s(t) = 16t^2
\]  
\[
\text{Distance} = 16t^2
\]

Find \(t\)
\[
\frac{866 - 16t^2}{16} \quad t^2 = 54.195
\]
\[
t = \pm \sqrt{54.195} \quad \boxed{7.397 \text{ sec}} \text{ or } \boxed{8.657 \text{ sec}}
\]

\(\text{Extraneous} \rightarrow t = \boxed{8.657 \text{ sec}}\)
Creating Perfect square trinomials

\[ y^2 + 10y + 25 \quad x^2 - 8x + 16 \quad z^2 - 2z + 1 \]

\[ (y+5)^2 \quad (x-4)^2 \quad (z-1)^2 \]

\[ \text{Create a perfect square trinomial, then factor.} \]

\[ x^2 + 11x + \frac{121}{4} \quad x^2 + 11x + 30.25 \]

\[ \text{fraction} \quad \text{decimal} \]

\[ 11 \text{ divided by } 2 \text{ is } \frac{11}{2} \quad 11 \text{ divided by } 2 \text{ is } 5.5 \]

\[ \frac{11}{2} \text{ squared is } \left( \frac{11}{2} \right)^2 = \frac{121}{4} \quad (x+5.5)^2 \]

Solving Quadratic Equations by completing the square

\[ x^2 + 4x + 1 = 0 \]
\[ x^2 + 4x = -1 \]

\[ x^2 + 4x + 4 = -1 + 4 \]
\[ (x+2)^2 = 3 \]
33) Solve by completing the square.

\[ \frac{9x^2 - 24x + 11}{9} = 0 \]

\[ \frac{9x^2}{9} - \frac{24x}{9} + \frac{11}{9} = -\frac{0}{9} \]

\[ x^2 - \frac{8}{3}x + \frac{11}{9} = 0 \]

\[ x^2 - \frac{8}{3}x = -\frac{11}{9} \]