Review Exercise Set 22

Exercise 1: Solve by using the completing the square method.

\[ x^2 - 2x - 63 = 0 \]

Exercise 2: Solve by using the completing the square method.

\[ y(y + 6) = -8 \]

Exercise 3: Solve by using the completing the square method.

\[ n^2 + 5n - 2 = 0 \]
Exercise 4: Solve by using the completing the square method.

\[ 2b^2 - 6b = 10 \]

Exercise 5: Solve by using the completing the square method.

\[ 2r^2 - 8r = -64 \]
Exercise 1: Solve by using the completing the square method.

\[ x^2 - 2x - 63 = 0 \]

Rewrite the equation with the constant on the right side of the equation

\[ x^2 - 2x = 63 \]

Take half of the coefficient for \( x \), square it, and add it to both sides of the equation

\[ \frac{1}{2}(-2) = -1; \quad (-1)^2 = 1 \]

\[ x^2 - 2x + 1 = 63 + 1 \]

\[ x^2 - 2x + 1 = 64 \]

Factor the perfect square trinomial

\[ (x - 1)^2 = 64 \]

Use the square root property

\[ x - 1 = \pm\sqrt{64} \]

\[ x = 1 \pm 8 \]

\[ x = 9 \quad \text{or} \quad x = -7 \]

Check:

\[ x^2 - 2x - 63 = 0 \]

\[ (9)^2 - 2(9) - 63 = 0 \]

\[ 81 - 18 - 63 = 0 \]

\[ 81 - 81 = 0 \]

\[ 0 = 0 \]

\[ (7)^2 - 2(-7) - 63 = 0 \]

\[ 49 + 14 - 63 = 0 \]

\[ 63 - 63 = 0 \]

\[ 0 = 0 \]

9 and -7 are the solutions for the equation
Exercise 2: Solve by using the completing the square method.

\[ y(y + 6) = -8 \]
\[ y^2 + 6y = -8 \]

\[ \frac{1}{2}(6) = 3; \quad (3)^2 = 9 \]

\[ y^2 + 6y + 9 = -8 + 9 \]
\[ (y + 3)^2 = 1 \]
\[ y + 3 = \pm \sqrt{1} \]
\[ y + 3 = \pm 1 \]
\[ y = -3 \pm 1 \]

\[ y = -3 + 1 \quad \text{or} \quad y = -3 - 1 \]
\[ y = -2 \quad y = -4 \]

Check
\[ y(y + 6) = -8 \quad y(y + 6) = -8 \]
\[ (-2)(-2 + 6) = -8 \quad (-4)(-4 + 6) = -8 \]
\[ (-2)(4) = -8 \quad (-4)(2) = -8 \]
\[ -8 = -8 \quad -8 = -8 \]

-2 and -4 are the solutions for the equation

Exercise 3: Solve by using the completing the square method.

\[ n^2 + 5n - 2 = 0 \]
\[ n^2 + 5n = 2 \]

\[ \frac{1}{2}(5) = \frac{5}{2}; \quad \left( \frac{5}{2} \right)^2 = \frac{25}{4} \]

\[ n^2 + 5n + \frac{25}{4} = 2 + \frac{25}{4} \]
\[ \left( n + \frac{5}{2} \right)^2 = \frac{8}{4} + \frac{25}{4} \]
Exercise 3 (Continued):

\[
\left( n + \frac{5}{2} \right)^2 = \frac{33}{4}
\]

\[
n + \frac{5}{2} = \pm \sqrt{\frac{33}{4}}
\]

\[
n = -\frac{5}{2} \pm \frac{\sqrt{33}}{2}
\]

\[
n = -\frac{5}{2} + \frac{\sqrt{33}}{2} \quad \text{or} \quad n = -\frac{5}{2} - \frac{\sqrt{33}}{2}
\]

Check:

\[
n^2 + 5n - 2 = 0
\]

\[
\left( -\frac{5 + \sqrt{33}}{2} \right)^2 + 5 \left( -\frac{5 + \sqrt{33}}{2} \right) - 2 = 0
\]

\[
\frac{25 - 10\sqrt{33} + 33}{4} + \frac{-25 + 5\sqrt{33}}{2} - 2 = 0
\]

\[
\frac{58 - 10\sqrt{33}}{4} + \frac{-50 + 10\sqrt{33}}{4} - \frac{8}{4} = 0
\]

\[
\frac{58 - 10\sqrt{33}}{4} + \frac{-58 + 10\sqrt{33}}{4} = 0
\]

\[
0 = 0
\]

\[
n^2 + 5n - 2 = 0
\]

\[
\left( -\frac{5 - \sqrt{33}}{2} \right)^2 + 5 \left( -\frac{5 - \sqrt{33}}{2} \right) - 2 = 0
\]

\[
\frac{25 + 10\sqrt{33} + 33}{4} + \frac{-25 - 5\sqrt{33}}{2} - 2 = 0
\]

\[
\frac{58 + 10\sqrt{33}}{4} + \frac{-50 - 10\sqrt{33}}{4} - \frac{8}{4} = 0
\]

\[
\frac{58 + 10\sqrt{33}}{4} + \frac{-58 - 10\sqrt{33}}{4} = 0
\]

\[
0 = 0
\]
Exercise 3 (Continued):

\[ \frac{-5 + \sqrt{33}}{2} \quad \text{and} \quad \frac{-5 - \sqrt{33}}{2} \] are the solutions

Exercise 4: Solve by using the completing the square method.

\[ 2b^2 - 6b = 10 \]

Multiply the equation by one-half to make the leading coefficient equal to one

\[ \frac{1}{2} (2b^2 - 6b) = \frac{1}{2} (10) \]

\[ b^2 - 3b = 5 \]

Take half of the coefficient for \( b \), square it, and add it to both sides of the equation

\[ \frac{1}{2} (-3) = \frac{-3}{2}; \quad \left( \frac{-3}{2} \right)^2 = \frac{9}{4} \]

\[ b^2 - 3b + \frac{9}{4} = 5 + \frac{9}{4} \]

\[ b^2 - 3b + \frac{20}{4} + \frac{9}{4} = \frac{29}{4} \]

Factor the perfect square trinomial

\[ \left( b - \frac{3}{2} \right)^2 = \frac{29}{4} \]

Use the square root property and solve for \( b \)

\[ b - \frac{3}{2} = \pm \sqrt{\frac{29}{4}} \]

\[ b = \frac{3}{2} \pm \sqrt{\frac{29}{2}} \]
Exercise 4 (Continued):

\[ b = \frac{3 + \sqrt{29}}{2} \quad \text{or} \quad b = \frac{3 - \sqrt{29}}{2} \]

Exercise 5:  Solve by using the completing the square method.

\[ 2r^2 - 8r = -64 \]
\[ \frac{1}{2}(2r^2 - 8r) = \frac{1}{2}(-64) \quad 2r^2 - 8r = -64 \]
\[ r^2 - 4r = -32 \]
\[ \frac{1}{2}(-4) = -2; \quad (-2)^2 = 4 \]
\[ r^2 - 4r + 4 = -32 + 4 \]
\[ r^2 - 4r + 4 = -28 \]
\[ (r - 2)^2 = -28 \]
\[ r - 2 = \pm\sqrt{-28} \]

It is not possible to take the square root of a negative number and get a real number, so this equation has no real solutions.