The Weekly Rigor

No. 215 "A mathematician is a machine for turning coffee into theorems." August 4, 2018

14 Problems in Using the Quadratic Formula

(Part 2)

7. Rearranging terms to get the equation in standard order, we have

$$-9x^2 + 12x + 3 = 0$$

Multiplying both sides of the equation by -1, we now have

$$9x^2 - 12x - 3 = 0$$

Using the Quadratic Formula

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

with $a = 9$, $b = -12$, and $c = -3$, we have by substitution

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-3)}}{2(9)} = \frac{12 \pm \sqrt{144 + 108}}{18} = \frac{12 \pm \sqrt{252}}{18} = \frac{12}{18} \pm \frac{\sqrt{252}}{18} =$$

$$= \frac{2}{3} \pm \frac{\sqrt{36 \cdot 7}}{18} = \frac{2}{3} \pm \frac{6\sqrt{7}}{18} = \frac{2}{3} \pm \frac{\sqrt{7}}{3}$$

9. Rearranging terms to get the equation in standard order, we have

$$4x^2 + 4x - 7 = 0$$

Using the Quadratic Formula

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

with $a = 4$, $b = 4$, and $c = -7$, we have by substitution

$$x = \frac{-4 \pm \sqrt{4^2 - 4(4)(-7)}}{2(4)} = \frac{-4 \pm \sqrt{16 + 112}}{8} = \frac{-4 \pm \sqrt{128}}{8} = -\frac{4}{8} \pm \frac{\sqrt{128}}{8} =$$

$$= -\frac{1}{2} \pm \frac{\sqrt{64 \cdot 2}}{8} = -\frac{1}{2} \pm \frac{8\sqrt{2}}{8} = -\frac{1}{2} \pm \sqrt{2}$$

11. Rearranging terms to get the equation in standard order, we have

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

Using the Quadratic Formula

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

with $a = 2$, $b = 1$, and $c = -4$, we have by substitution

$$x = \frac{-1 \pm \sqrt{1^2 - 4(2)(-4)}}{2(2)} = \frac{-1 \pm \sqrt{1 + 32}}{4} = \frac{-1 \pm \sqrt{33}}{4} = -\frac{1}{4} \pm \frac{\sqrt{33}}{4}$$

13. Rearranging terms to get the equation in standard order, we have

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

Using the Quadratic Formula

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

with $a = 2$, $b = -1$, and $c = -5$, we have by substitution

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-5)}}{2(2)} = \frac{1 \pm \sqrt{1 + 40}}{4} = \frac{1 \pm \sqrt{41}}{4} = \frac{1}{4} \pm \frac{\sqrt{41}}{4}$$