

Answer on Question #70268 – Math – Algebra

Question

Solve for x, y, z.

$$\begin{cases} \frac{x+2}{3} - y + \frac{4}{2} + z + \frac{1}{6} = 0 \\ x - \frac{4}{3} + y + \frac{1}{4} + z - \frac{2}{2} = -1 \\ x + \frac{1}{2} + \frac{y}{2} + z - \frac{1}{4} = \frac{3}{4} \end{cases}$$

Solution

$$\begin{cases} \frac{2(x+2) - 6y + 3 \times 4 + 6z + 1}{6} = 0 \\ \frac{12x - 4 \times 4 + 12y + 3 + 12z - 6 \times 2}{12} = -1 \\ \frac{4x + 2 + 2y + 4z - 1}{4} = \frac{3}{4} \end{cases}$$

$$\begin{cases} 2x + 4 - 6y + 12 + 6z + 1 = 0 \\ 12x - 16 + 12y + 3 + 12z - 12 = -12 \\ 4x + 2 + 2y + 4z - 1 = 3 \end{cases}$$

$$\begin{cases} 2x - 6y + 6z = -17 \\ 12x + 12y + 12z = 13 \\ 4x + 2y + 4z = 2 \end{cases}$$

$$\begin{cases} x - 3y + 3z = -\frac{17}{2} \\ x + y + z = \frac{13}{12} \\ 2x + y + 2z = 1 \end{cases}$$

$$\begin{cases} x = 3y - 3z - \frac{17}{2} \\ z = -x - y + \frac{13}{12} \\ y = -2x - 2z + 1 \end{cases} \quad (1)$$

Substituting for y into the first equation of the system (1)

$$x = 3(-2x - 2z + 1) - 3z - \frac{17}{2}$$

$$x = \frac{-9z}{7} - \frac{11}{14} \quad (2)$$

Substituting the previous formula (2) into the third equation of the system (1)

$$y = -2\left(\frac{-9z}{7} - \frac{11}{14}\right) - 2z + 1 = \frac{4z}{7} + \frac{18}{7} \quad (3)$$

Substituting the previous formulas (2), (3) into the second equation of the system (1)

$$z = \frac{9z}{7} + \frac{11}{14} - \frac{4z}{7} - \frac{18}{7} + \frac{13}{12} \Rightarrow$$

$$z = \frac{5z}{7} - \frac{25}{14} + \frac{13}{12} \Rightarrow$$

$$\frac{2z}{7} = \frac{13}{12} - \frac{25}{14} \Rightarrow$$

$$\frac{2z}{7} = \frac{1}{2} \times \frac{13 \times 7 - 25 \times 6}{6 \times 7} \Rightarrow$$

$$z = -\frac{59}{24} \quad (4)$$

Substituting for z from (4) into (2)

$$x = -\frac{9}{7} \times \left(-\frac{59}{24}\right) - \frac{11}{14} = \frac{19}{8}$$

Substituting for z from (4) into (3)

$$y = \frac{4}{7} \times \left(-\frac{59}{24}\right) + \frac{18}{7} = \frac{7}{6}$$

Answer:

$$\begin{cases} x = \frac{19}{8} \\ y = \frac{7}{6} \\ z = -\frac{59}{24} \end{cases}$$