Date

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(Matrix Invers)

5. $3x + 4y + 9z = 45$
$5y + 2z = 32$
$4x + 2y + 4z = 32$

$Ax = b$
$x = A^{-1}b$

$$A^{-1} = \frac{1}{3(5\cdot4-2\cdot2)-4(0\cdot4-4\cdot2)+9(0\cdot2-4\cdot5)} \begin{pmatrix} 16 & 2 & -37 \\ 8 & -24 & -6 \\ -20 & 10 & 15 \end{pmatrix}$$

$$= \frac{1}{-100} \begin{pmatrix} 16 & 2 & -37 \\ 8 & -24 & -6 \\ -20 & 10 & 15 \end{pmatrix} = \begin{pmatrix} -\frac{16}{100} & -\frac{2}{100} & \frac{37}{100} \\ -\frac{8}{100} & \frac{24}{100} & \frac{6}{100} \\ \frac{20}{100} & -\frac{10}{100} & -\frac{15}{100} \end{pmatrix}$$

$$A^{-1}.B = \begin{pmatrix} -\frac{16}{100} & -\frac{2}{100} & \frac{37}{100} \\ -\frac{8}{100} & \frac{24}{100} & \frac{6}{100} \\ \frac{20}{100} & -\frac{10}{100} & -\frac{15}{100} \end{pmatrix} \begin{pmatrix} 45 \\ 32 \\ 32 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -\frac{16}{100}(45) + \left(-\frac{2}{100}(32)\right) + \frac{37}{100}(32) \\ -\frac{8}{100}(45) + \frac{24}{100}(32) + \frac{6}{100}(32) \\ \frac{20}{100}(45) + \left(-\frac{10}{100}(32)\right) + \left(-\frac{15}{100}(32)\right) \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{vmatrix} -\frac{720}{100} & -\frac{64}{100} & +\frac{1184}{100} \\ -\frac{360}{100} & +\frac{768}{100} & +\frac{192}{100} \\ \frac{900}{100} & -\frac{320}{100} & -\frac{480}{100} \end{vmatrix}$$

$$x = \frac{400}{100} = 4$$

$$y = \frac{600}{100} = 6$$

$$z = \frac{100}{100} = 1$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \\ 1 \end{pmatrix} //$$

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Creamer's Rule

$$3x + 4y + 9z = 45$$
$$5y + 2z = 32$$
$$4x + 2y + 4z = 32$$

\# $Ax = b$

$$\begin{pmatrix} 3 & 4 & 9 \\ 0 & 5 & 2 \\ 4 & 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 45 \\ 32 \\ 32 \end{pmatrix}$$

$$x = \frac{\begin{pmatrix} 45 & 4 & 9 \\ 32 & 5 & 2 \\ 32 & 2 & 4 \end{pmatrix}}{\begin{pmatrix} 3 & 4 & 9 \\ 0 & 5 & 2 \\ 4 & 2 & 4 \end{pmatrix}} = \frac{45(5.4 - 2.2) - 4(32.4 - 32.2) + 9(32.2 - 32.5)}{3(5.4 - 2.2) - 4(0.4 - 4.2) + 9(0.2 - 4.5)}$$

$$= \frac{720 - 256 + (-864)}{48 - (-32) + (-180)}$$

$$= \frac{-400}{-100} = 4 //$$

$$y = \frac{\begin{pmatrix} 3 & 45 & 9 \\ 0 & 32 & 2 \\ 4 & 32 & 4 \end{pmatrix}}{\begin{pmatrix} 3 & 4 & 9 \\ 0 & 5 & 2 \\ 4 & 2 & 4 \end{pmatrix}} = \frac{3(32.4 - 32.2) - 45(0.4 - 4.2) + 9(0.32 - 4.32)}{3(5.4 - 2.2) - 4(0.4 - 4.2) + 9(0.2 - 4.5)}$$

$$= \frac{192 - (-360) + (-1152)}{48 - (-32) + (-180)}$$

$$= \frac{-600}{-100} = 6 //$$

$$z. = \frac{\begin{pmatrix} 3 & 4 & 45 \\ 0 & 5 & 32 \\ 4 & 2 & 32 \end{pmatrix}}{\begin{pmatrix} 3 & 4 & 9 \\ 0 & 5 & 2 \\ 4 & 2 & 4 \end{pmatrix}} = \frac{3(5\cdot 32 - 2\cdot 32) - 4(0.32 - 4\cdot 32) + 45(0.2 - 4.5)}{3(5\cdot 4 - 2\cdot 2) - 4(0.4 - 4\cdot 2) + 9(0.2 - 4.5)}$$

$$= \frac{288 - (-512) + (-900)}{48 - (-32) + (-180)}$$

$$= \frac{-100}{-100} = 1 \text{ //}$$