

Worksheet

12/07/2020

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Problem quickname: 3339

1)Quick:
3339

Solve the linear equation system. Use the Gaussian Elimination algorithm.

$$\begin{array}{r}
 \text{a)} \quad 10y + -7z = 28 \\
 \quad \quad 80y + -65z = 170 \\
 \\
 \quad \quad 10y + -7z = 28 \quad (1) \\
 \quad \quad 80y + -65z = 170 \quad (2) \quad | + (-8) \times (1) \\
 \\
 \quad \quad 10y + -7z = 28 \quad (1) \\
 \quad \quad \quad -9z = -54 \quad (2)
 \end{array}$$

Determine variable values:

$$(2) \Rightarrow x_2 = 6$$

$$(1) \Rightarrow 10x_1 + (-42) = 28 \Rightarrow 10x_1 = 70 \Rightarrow x_1 = 7$$

Solution: $y = 7, z = 6$

$$\begin{array}{r}
 \text{b)} \quad 7y + 2z = 0 \\
 \quad \quad -56y + -20z = 28 \\
 \\
 \quad \quad 7y + 2z = 0 \quad (1) \\
 \quad \quad -56y + -20z = 28 \quad (2) \quad | + 8 \times (1) \\
 \\
 \quad \quad 7y + 2z = 0 \quad (1) \\
 \quad \quad \quad -4z = 28 \quad (2)
 \end{array}$$

Determine variable values:

$$(2) \Rightarrow x_2 = -7$$

$$(1) \Rightarrow 7x_1 + (-14) = 0 \Rightarrow 7x_1 = 14 \Rightarrow x_1 = 2$$

Solution: $y = 2, z = -7$ 2)Quick:
3339

Solve the linear equation system.

$$\begin{array}{r}
 \text{a)} \quad 4y + -8z = -8 \\
 \quad \quad -4y \quad \quad = 40
 \end{array}$$

Triangular form:

$$\begin{array}{r}
 4y + -8z = -8 \quad (1) \\
 \quad \quad -8z = 32 \quad (2)
 \end{array}$$

Determine variable values:

$$(2) \Rightarrow x_2 = -4$$

$$(1) \Rightarrow 4x_1 + 32 = (-8) \Rightarrow 4x_1 = -40 \Rightarrow x_1 = -10$$

Solution: $y = -10, z = -4$

$$\text{b) } \begin{array}{rcl} 4y & + & -9z = -29 \\ -32y & + & 77z = 257 \end{array}$$

Triangular form:

$$\begin{array}{rcl} 4y & + & -9z = -29 \quad (1) \\ & & 5z = 25 \quad (2) \end{array}$$

Determine variable values:

$$(2) \Rightarrow x_2 = 5$$

$$(1) \Rightarrow 4x_1 + (-45) = (-29) \Rightarrow 4x_1 = 16 \Rightarrow x_1 = 4$$

Solution: $y = 4, z = 5$

3)

Solve the linear equation system.

Quick:
3339

$$\text{a) } \begin{array}{rcl} -7x_1 & + & 9x_2 & + & -10x_3 & + & 7x_4 & = & 123 \\ -7x_1 & + & -x_2 & + & -2x_3 & + & 5x_4 & = & 73 \\ 28x_1 & + & 24x_2 & + & -2x_3 & + & -11x_4 & = & -170 \\ -28x_1 & + & -44x_2 & + & 54x_3 & + & 30x_4 & = & 146 \end{array}$$

Determine variable values:

$$(4) \Rightarrow x_4 = 8$$

$$(3) \Rightarrow 6x_3 + 40 = 22 \Rightarrow 6x_3 = -18 \Rightarrow x_3 = -3$$

$$(2) \Rightarrow (-10)x_2 + (-24) + (-16) = (-50) \Rightarrow (-10)x_2 = -10 \Rightarrow x_2 = 1$$

$$(1) \Rightarrow (-7)x_1 + 9 + 30 + 56 = 123 \Rightarrow (-7)x_1 = 28 \Rightarrow x_1 = -4$$

Solution: $x_1 = -4, x_2 = 1, x_3 = -3, x_4 = 8$

$$\text{b) } \begin{array}{rcl} -5x_1 & + & -3x_2 & + & 4x_3 & + & -2x_4 & = & -42 \\ 15x_1 & + & 5x_2 & + & -17x_3 & + & 10x_4 & = & 139 \\ 20x_1 & + & 52x_2 & + & 31x_3 & + & -40x_4 & = & -51 \\ 20x_1 & + & 20x_2 & + & -21x_3 & + & -48x_4 & = & -383 \end{array}$$

Determine variable values:

$$(4) \Rightarrow x_4 = 10$$

$$(3) \Rightarrow (-3)x_3 + (-80) = (-89) \Rightarrow (-3)x_3 = -9 \Rightarrow x_3 = 3$$

$$(2) \Rightarrow (-4)x_2 + (-15) + 40 = 13 \Rightarrow (-4)x_2 = -12 \Rightarrow x_2 = 3$$

$$(1) \Rightarrow (-5)x_1 + (-9) + 12 + (-20) = (-42) \Rightarrow (-5)x_1 = -25 \Rightarrow x_1 = 5$$

Solution: $x_1 = 5, x_2 = 3, x_3 = 3, x_4 = 10$

4)

Solve the linear equation system.

$$\begin{array}{rclcl}
 & 6x_1 & + & -9x_2 & + & -6x_3 & + & -5x_4 & = & 57 \\
 & & & 5x_2 & + & 4x_3 & + & 6x_4 & = & -10 \\
 \text{a)} & -42x_1 & + & 73x_2 & + & 56x_3 & + & 45x_4 & = & -371 \\
 & -24x_1 & + & 16x_2 & + & 44x_3 & + & -25x_4 & = & 127
 \end{array}$$

Triangular form:

$$\begin{array}{rclcl}
 6x_1 & + & -9x_2 & + & -6x_3 & + & -5x_4 & = & 57 & (1) \\
 & & 5x_2 & + & 4x_3 & + & 6x_4 & = & -10 & (2) \\
 & & & & 6x_3 & + & -2x_4 & = & 48 & (3) \\
 & & & & & & -9x_4 & = & 27 & (4)
 \end{array}$$

Determine variable values:

$$(4) \Rightarrow x_4 = -3$$

$$(3) \Rightarrow 6x_3 + 6 = 48 \Rightarrow 6x_3 = 42 \Rightarrow x_3 = 7$$

$$(2) \Rightarrow 5x_2 + 28 + (-18) = (-10) \Rightarrow 5x_2 = -20 \Rightarrow x_2 = -4$$

$$(1) \Rightarrow 6x_1 + 36 + (-42) + 15 = 57 \Rightarrow 6x_1 = 48 \Rightarrow x_1 = 8$$

Solution: $x_1 = 8, x_2 = -4, x_3 = 7, x_4 = -3$

$$\begin{array}{rclcl}
 & 3x_1 & + & -8x_2 & + & 4x_3 & + & -5x_4 & = & 3 \\
 \text{b)} & -3x_1 & + & 16x_2 & + & -x_3 & + & 9x_4 & = & -39 \\
 & -21x_1 & & & + & -51x_3 & + & 14x_4 & = & 295 \\
 & -6x_1 & + & -16x_2 & + & -30x_3 & + & 32x_4 & = & 482
 \end{array}$$

Triangular form:

$$\begin{array}{rclcl}
 3x_1 & + & -8x_2 & + & 4x_3 & + & -5x_4 & = & 3 & (1) \\
 & & 8x_2 & + & 3x_3 & + & 4x_4 & = & -36 & (2) \\
 & & & & -2x_3 & + & 7x_4 & = & 64 & (3) \\
 & & & & & & 3x_4 & = & 24 & (4)
 \end{array}$$

Determine variable values:

$$(4) \Rightarrow x_4 = 8$$

$$(3) \Rightarrow (-2)x_3 + 56 = 64 \Rightarrow (-2)x_3 = 8 \Rightarrow x_3 = -4$$

$$(2) \Rightarrow 8x_2 + (-12) + 32 = (-36) \Rightarrow 8x_2 = -56 \Rightarrow x_2 = -7$$

$$(1) \Rightarrow 3x_1 + 56 + (-16) + (-40) = 3 \Rightarrow 3x_1 = 3 \Rightarrow x_1 = 1$$

Solution: $x_1 = 1, x_2 = -7, x_3 = -4, x_4 = 8$

Good Luck!