

Elimination Using Matrices

$$\begin{array}{r}
 x - 2y + 4z = 6 \\
 -2x + 3y - 6z = -14 \\
 3x + y - z = -1
 \end{array}
 \longrightarrow
 \left[\begin{array}{ccc|c}
 1 & -2 & 4 & 6 \\
 -2 & 3 & -6 & -14 \\
 3 & 1 & -1 & -1
 \end{array} \right]
 \longrightarrow
 \left[\begin{array}{ccc|c}
 1 & * & * & * \\
 0 & 1 & * & * \\
 0 & 0 & 1 & *
 \end{array} \right]$$

“augmented matrix”
“row echelon form”

Elementary Row Operations:

1. Interchange any two rows (interchange any two equations)
2. Multiply any row by a (nonzero) constant (multiply any equation by a constant)
3. Add any multiple of one row to another (add any multiple of one eq'n to another)

For each of the following problems, solve for x , y , and z if possible. Use matrices and elimination rather than dealing directly with the given system.

1 – 8 Use the problems from the **Linear Systems I** handout. The answers will be the same as there.

9 $2x + y = 1$
 $3x + 2y = 3$

10 $x - 3y = 2$
 $-3x + 9y = 5$

11 $2x - 3y = 1$
 $4x - 6y = 2$

12 $4x - 3y = 15$
 $2x + 2y = 18$

13 $x + z = 1$
 $y + z = 3$
 $x + y = -2$

14 $x + 2y + z = -1$
 $x + y + z = 1$
 $2x + y + 2z = 4$

Answers:

9 $(x, y) = (6, 3)$ 10 inconsistent 11 $h - x\frac{3}{2} - z\frac{3}{1} = (h, x, z)$ 12 $(x, y) = (3, 0, -2)$ 13 $(x, y, z) = (3, -2, -2)$ 14 $(x, y, z) = (3, 0, -2)$