

A thick black L-shaped frame surrounds the text. The top-left corner is a horizontal bar extending to the right, and the bottom-right corner is a vertical bar extending upwards. The text is centered within the open space of the frame.

APPLICATIONS OF THE DETERMINANT

Section 3.4

CRAMER'S RULE

Consider the system $A\mathbf{x} = \mathbf{b}$ (n equations, n unknowns). If $\det A \neq 0$, then the solution is given by

$$x_1 = \frac{|A_1|}{|A|}, \quad x_2 = \frac{|A_2|}{|A|}, \quad \dots, \quad x_n = \frac{|A_n|}{|A|},$$

where A_i is matrix A , but with column i replaced with \mathbf{b} .

Solve the system:

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

$$2x \quad \quad + z = 0$$

$$3x - 4y + 4z = 2$$

REMARK

Different ways of solving $A\mathbf{x} = \mathbf{b}$:

1. Gauss-Jordan Elimination (to reduced row-echelon form)
2. $\mathbf{x} = A^{-1}\mathbf{b}$ (assuming A^{-1} exists)
3. Cramer's Rule (assuming $\det A \neq 0$)