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

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

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

Solve the system:

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

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

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

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 $\det A \neq 0$)