

MATH 2E Prep: Determinants

Facts to Know:

- 2×2 determinants: $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

- 3×3 determinants: cofactor expansion along the first row:

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & m \end{vmatrix} = a \cdot \begin{vmatrix} e & f \\ h & m \end{vmatrix} - b \cdot \begin{vmatrix} d & f \\ g & m \end{vmatrix} + c \cdot \begin{vmatrix} d & e \\ g & h \end{vmatrix}$$

Examples:

1. Calculate $\begin{vmatrix} 1 & 4 \\ 2 & -5 \end{vmatrix}$.

$$= 1 \cdot (-5) - 2 \cdot 4 = -5 - 8 = -13$$

2. Calculate $\begin{vmatrix} 3 & 0 & 2 \\ 1 & -3 & 4 \\ -1 & 1 & 2 \end{vmatrix}$.

$$= 3 \cdot \begin{vmatrix} -3 & 4 \\ 1 & 2 \end{vmatrix} - 0 \cdot \begin{vmatrix} 1 & 4 \\ -1 & 2 \end{vmatrix} + 2 \cdot \begin{vmatrix} 1 & -3 \\ -1 & 1 \end{vmatrix}$$

$$= 3 \cdot (-6 - 4) - 0 + 2(1 - (-1)(-3))$$

$$= -30 - 0 + (-4) = -34$$