4.4 Determinants

The 2×2 system

$$\begin{cases} a_1 x + b_1 y = c_1 \\ a_2 x + b_2 y = c_2 \end{cases}$$

has a coefficient matrix $\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix}$

with the determinant

$$\det A = |A| = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} =$$

$$a_1 b_2 - a_2 b_1$$

Find the determinant of:

$$A = \begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}$$

$8 - -3 = 11$

$$B = \begin{bmatrix} -1 & 2 \\ 2 & -4 \end{bmatrix}$$

$4 - 4 = 0$

The 3x3 system

$$\begin{cases} a_1 x + b_1 y + c_1 z = d_1 \\ a_2 x + b_2 y + c_2 z = d_2 \\ a_3 x + b_3 y + c_3 z = d_3 \end{cases}$$

has a coefficient matrix

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$$

with determinant

$$\det A = |A| = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

$$= a_1 \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - b_1 \begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + c_1 \begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix}$$

Find the determinant of

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 0 & 2 & 3 \\ 3 & 4 & 2 \end{bmatrix}$$

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

$$-1(4-12) - 1(0-9) + 2(0-6)$$

$$-1(-8) - 1(-9) + 2(-6)$$

$$8 + 9 - 12$$

$$5$$

HW: p. 282

2-40 even,

odds &c.

calc. on 32-40.