6.3) Determinants

Worked example

Calculate the determinant then decide if the matrix has an inverse.

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -2 \\ -3 & -4 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -2 \\ -3 & 6 \end{pmatrix}$$

Your turn

Calculate the determinant then decide if the matrix has an inverse.

$$\begin{pmatrix} 0 & -3 \\ -1 & -4 \end{pmatrix}$$

-7 Yes

$$\begin{pmatrix} 10 & -2 \\ 5 & -1 \end{pmatrix}$$

0 No

Worked example

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

Given that $\mathbf{A}$ is singular, find the value of p.

Your turn

$$A = \begin{pmatrix} 4 & p+2 \\ -1 & 3-p \end{pmatrix}$$

Given that $\mathbf{A}$ is singular, find the value of p.

$$p = \frac{14}{3}$$

Worked example

$$\begin{vmatrix} 3 & 1 & 4 \\ 7 & 2 & 5 \\ -3 & 4 & 3 \end{vmatrix}$$

Find the minor of:

a) 2

b) -3

c) 7

Your turn

$$\begin{pmatrix} 1 & 2 & 0 \\ 4 & 5 & -6 \\ -1 & 8 & 2 \end{pmatrix}$$

Find the minor of:

a) 5 $\begin{vmatrix} 1 & 0 \\ -1 & 2 \end{vmatrix} = 2$

b) 0 $\begin{vmatrix} 4 & 5 \\ -1 & 8 \end{vmatrix} = 37$

c) -6 $\begin{vmatrix} 1 & 2 \\ -1 & 8 \end{vmatrix} = 10$

Worked example

Calculate the determinant:

$$\begin{vmatrix} 2 & 1 & 0 \\ 5 & 4 & -6 \\ 8 & -1 & 2 \end{vmatrix}$$

Your turn

Calculate the determinant:

$$\begin{vmatrix} 1 & 2 & 0 \\ 4 & 5 & -6 \\ -1 & 8 & 2 \end{vmatrix}$$

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Worked example

$$\boldsymbol{A} = \begin{pmatrix} 2 & 1 & -4 \\ 2k+1 & 3 & k \\ 1 & 0 & 1 \end{pmatrix}$$

where k is a constant.

Given that A is singular, find the possible values of k

Your turn

$$\boldsymbol{A} = \begin{pmatrix} 3 & k & 0 \\ -2 & 1 & 2 \\ 5 & 0 & k+3 \end{pmatrix}$$

where k is a constant.

Given that A is singular, find the possible values of k

$$k = -\frac{1}{2}, -9$$