

## Example of finding the determinant of a $3 \times 3$ matrix

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This leaflet will show you how to find the determinant of a  $3 \times 3$  matrix.

$$B = \begin{pmatrix} 4 & -1 & 3 \\ 5 & 2 & 1 \\ -2 & 7 & 0 \end{pmatrix}$$

We will choose the third column with elements 3, 1, 0. The determinant is then given by

$$\det(B) = 3 \times \text{cofactor of } 3 + 1 \times \text{cofactor of } 1 + 0 \times \text{cofactor of } 0$$

Note that we don't need to work out the cofactor of 0 since it is going to be multiplied by zero.

Minor of 3:  $\begin{vmatrix} 5 & 2 \\ -2 & 7 \end{vmatrix} = 35 + 4 = 39$ . The place sign of 3 is +, so the cofactor is 39.

Minor of 1:  $\begin{vmatrix} 4 & -1 \\ -2 & 7 \end{vmatrix} = 28 - 2 = 26$ . The place sign of 1 is -, so the cofactor is -26.

Putting these results together gives

$$\det(B) = (3 \times 39) + (1 \times -26) + 0 = 117 - 26 = 91$$

You could have chosen any other row or column at the start and you would still obtain the answer 91. You would have a little more work to do if you had chosen a row or column that did not include the element 0.

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Note that a video tutorial covering the content of this leaflet is available from **sigma**.