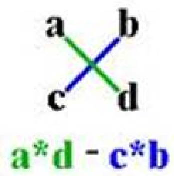
DETERMINANTS

Created: Thursday, 24 November 2011 12:22 | Published: Thursday, 24 November 2011 12:22 | Written by Super User | Print

What are Determinants?



To every square matrix A = [a_{ij}] of order n, we can associate a number (real or complex) called determinant of the square matrix A, where a_{ij} = (i, j)th element of A.

Determinant of a matrix of order one

Let A = [a] be the matrix of order 1, then determinant of A is defined to be equal to ‘a’.
For example: If A = [5] then lAl = 5

Determinant of a matrix of order two

If $A = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$ then, determinant A is given by

$$|A| = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11}\ a_{22} - a_{21}\ a_{12}$$

For example: Evaluate $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}$

Answer: $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix} = x^2 - (x^2 - 1)$

$$= x^2 - x^2 + 1 = 1$$

Determinant of a matrix of order three

Determinant of a matrix of order three can be determined by expressing it in terms of second order determinants. This is known as expansion of a determinant along a row or a column. There are six ways of expanding a determinant of order 3 corresponding to each three rows and three columns. Commonly we use the expansion along R_1 (row 1).

Let $A = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

$|A| = a_{11} \begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} - a_{12} \begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix} + a_{13} \begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$

$= a_{11} (a_{22} \times a_{33} - a_{32} \times a_{23}) - a_{12} (a_{21} \times a_{33} - a_{31} \times a_{23}) + a_{13} (a_{21} \times a_{32} - a_{31} \times a_{22})$

For example: Evaluate $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

Answer: $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

Here, $a_{11} = 3$, $a_{12} = -1$, $a_{13} = -2$

$a_{21} = 0$, $a_{22} = 0$, $a_{23} = -1$

$a_{31} = 3$, $a_{32} = -5$, $a_{33} = 0$

According to formula:

$a_{11} (a_{22} \times a_{33} - a_{32} \times a_{23}) - a_{12} (a_{21} \times a_{33} - a_{31} \times a_{23}) + a_{13} (a_{21} \times a_{32} - a_{31} \times a_{22})$

Substituting the values in the above formula, we get:

$= 3 (0 - 5) - (-1) (0 - (-3)) - 2 (0 - 0) = -15 + 3 - 0 = -12$

Try this:

What value of x makes the determinant ?4?

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

Now try it yourself! Should you still need any help, click here to schedule live online session with e Tutor!

About eAge Tutoring:

eAgeTutor.com is the premium online tutoring provider. Using materials developed by highly qualified educators and leading content developers, a team of top-notch software experts, and a group of passionate educators, eAgeTutor works to ensure the success and satisfaction of all of its students.

Contact us today to learn more about our tutoring programs and discuss how we can help make the dreams of the student in your life come true!

Reference Links:

- http://en.wikipedia.org/wiki/Determinant
- http://www.britannica.com/EBchecked/topic/561660/square-matrix
- http://www.mathreference.com/la-mpoly,order.html
- http://en.wikipedia.org/wiki/Row_and_column_spaces
-

Category:ROOT

Joomla SEF URLs by Artio