**Determinants of Matrix**

**Det:**

Let A= is 2\*2 matrix, the determinant of A is denoted by

Det ==ad-bc.

det A or = Det A or - operator

For 3\*3 matrix, an example is like below:

A= det A or =

a1- b1

=

**Properties of Determinant:**

**1.**Any metrix A and its transpose have name determinant.

det A= det

Ex: A= =

Det A=cd-bc det =ad-bc

**2.**The determinant of a triangular matrix is the product of the enteritis on the diagonal that is

**3.**If one row (or column) of a determinant is zero, thus the value of the determinant is zero

Ex:

**4.**Interchanging the corresponding rows and column of a determinant is unavailable the value

Ex:

**5.** Interchanging any two rows (or column) of a determinant change the sign the value of without altering is numerical values.

Ex: :

**6.** If any two rows (or column) of a determinant are identical, then the value of the determinant is zero.

Ex: :

**7.** If each of the element of a row (or column) of a determinant is multiplied by any number is, then the value of the determinant is multiplied by m.

Ex: :

**8.**If each element of a row (or column) of a determinant is expressed as the sum or more numbers, then the determinant may be expressed as the sum of two or more determinants.

Ex: :

**Example of properties 2:**

A= First make if triangle matrix.

=2. = 7=det A

**Conjugate element:**

Let = ( …..) be a determinant of order n. Then the element is called the conjugate element of and vice versa.

∴ conjugate element of 2 is 4 (a\_12 →a\_21)

conjugate element of 2 is 4 (

conjugate element of 3 is 7 (

conjugate element of 6 is 8 (

conjugate element of 2 is 4 (

Ex:=

**Mirrors and cofactor:**

Mirror for is : =(

Cofactor for is :=

Similarly,

Mirror for is : =(

Cofactor for is := -(

Let =

**Complementary Minors:**

Let ∆5 = (a11 a22  a33  a44 a55)

(i) Minor of = ;

Complementary Minor for ==

(ii) Minor of = ;

Complementary Minor for ==

(iii) Minor of = ;

Complementary Minor for ==

Similarly, Complementary for ==

**Algebraic Compliment:**

Algebraic Complement for is:

(-)1+3+5+2+4+5 = =

Example 1:

Find the cofactor matrix of A=

Ans: First find the cofactor of each element:

= =

==

= =

= =

=

Thus, the cofactor matrix is:

Example 2:

Find the cofactor matrix of A=

Ans: First find the cofactor of each element:

= =

==

= =

= =

=

Thus, the cofactor matrix is:

Example 3:

Find the cofactor matrix of A=

Ans: First find the cofactor of each element:

= =

==

= =

= =

=

Thus, the cofactor matrix is:

Example 4:

Find the cofactor matrix of A=

Ans: First find the cofactor of each element:

= =

==

= =

= =

=

Thus, the cofactor matrix is:

Example 5:

Find the cofactor matrix of A=

Ans: First find the cofactor of each element:

= =

==

= =

= =

=

Thus, the cofactor matrix is:

**Differential coefficient of Determinant:**

Let be a determinant of order n and let the element of are function of x. Then can be defined by the following way.

= + + + ………………. + , where , (i=1,2,3,4,5…….n) keeping other rows (or column) remain same but only diff, .

**Ex:**  = determine ;

Ans:

= + +

= + + Ans.

**Ex 1:**

1. prove that = -(ac-)(a+2bxy+c)

Ans:

=-(ac-)(a+2bxy+c)

**Ex 2:**  Prove that =

Ans: = =

**Ex 3:**  Prove that = 4

Ans:

= abc

= abc

= abc

=abc(-2c)(-ab-ab) = 4

**Ex 4:**

∆ = determine

Ans:

= + +

= + +

**Ex 5:**

∆ = determine

Ans:

= + +

= + +

Example 1.

Prove that

= - (ac - b2) (ax2 + abxy+cy2).

Ans: c3’ = c3 - (x4 + yc2)

= - (ac - b2) (ax2 + abxy + cy2).

Example 2.

Prove that =

Ans:

= 1/ a2b2c2 =

Example 3.

Prove that = 4a2b2c2

Ans:c1’ = c1 – (c2 + c3)

abc

= = abc (-2c) (-ab – ab) = 4a2b2c2

=L.H.S = R.H.S

Example 4.

Prove That =2(b+c)(c+a)(a+b)

Example 5.

Prove that

Example 6.

Prove that

Example 7.

Prove that

Example 8.

Show that

Example 9.

Show that

Example 10.

Show that