

# Matrix Operations

**Talk to a Teacher**  
**National Mission on Education through ICT**

<http://spoken-tutorial.org>

Script

**Shalini Shrivastava**

(IIT Bombay)

Narration

**Anuradha Amrutkar**

(IIT Bombay)

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# Objectives

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- **Access the element of Matrix.**



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- **Determine the determinant, inverse and eigenvalue of a matrix.**
- **Define the special matrices.**



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- **Solve the system of linear equations.**



# Prerequisites

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- **I am using Windows 7 OS and Scilab 5.2.2 for demonstration.**



# Exercise 1

$$\text{If } \mathbf{A} = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 1 \\ 4 & 1 & 5 \end{bmatrix}$$



# Exercise 1

- Find  $A(:, :)$
- Extract the second column of  $A$
- Determine the determinant and eigenvalues of the matrix,  $A^2 + 2 * A$ .



# Linear Systems

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# Linear Systems

- **One of the important sets of operations a user carries out on matrices are elementary row or column operations.**
- **They involve executing row operations on a matrix to make entries below a non-zero number, zero.**



# Linear Equations

Lets solve the following set of linear equations:

$$x_1 + 2x_2 - x_3 = 1$$

$$-2x_1 - 6x_2 + 4x_3 = -2$$

$$-x_1 - 3x_2 + 3x_3 = 1$$



# Exercise 2

- **Define a 3x3 matrix A with all elements equal to 1.  
Multiply 1st and 2nd row with scalars, 3 and 4 respectively, and determine the determinant of the resultant matrix.**



# Exercise 2

- Represent the following linear system as a matrix equation. Solve the system using the inverse method:

$$x + y + 2z - w = 3$$

$$2x + 5y - z - 9w = -3$$

$$2x + y - z + 3w = -11$$

$$x - 3y + 2z + 7w = -5$$



# Exercise 2

- a) Try solving the above system using the backslash method.**
- b) Verify the solution of part (a).**



# Exercise 2

$$\text{If } \mathbf{A} = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 6 & 5 \\ 1 & 3 & 6 \end{bmatrix}$$

**Use a suitable sequence of row operations on A to bring A to upper triangular form.**



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**In this tutorial, we have learnt to,**

- **Access the element of the matrix using colon(:).**
- **Calculate the inverse of matrix using "inv" command or by black slash.**
- **Calculate the determinant of a matrix using "det()" command.**
- **Calculate the eigenvalues of a matrix using "spec()" command.**



# Summary continue..

- **Define a matrix having all elements one, Null matrix, Identity matrix and a matrix with random elements by using functions ones(), zeros(), eye(), rand() respectively.**



# Summary continue..

- **Define a matrix having all elements one, Null matrix, Identity matrix and a matrix with random elements by using functions ones(), zeros(), eye(), rand() respectively.**
- **Solve the systems of linear equations.**



# Acknowledgement

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- More information on the FOSSEE project could be obtained from <http://fossee.in> or <http://scilab.in>



# Acknowledgement

- **Supported by the National Mission on Education through ICT, MHRD, Government of India.**



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- For more information, visit:  
<http://spoken-tutorial.org/NMEICT-Intro>

