

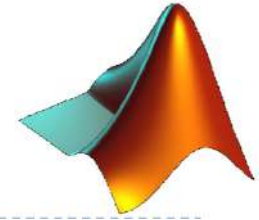
Short Term Training Program on
“MATLAB”,
In collaboration with NITTTR, Chandigarh

MATLAB Essentials

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MATLAB as Scratchpad



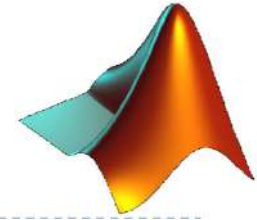
Calculate the area of a circle with a radius of 2.5 m.

```
» area = pi * 2.5^2
```

```
area =
```

```
19.6350
```

Play with Variables

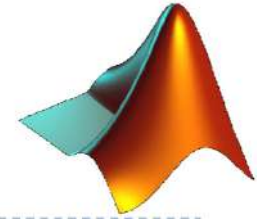


Suppose that $x = 3$ and $y = 4$. Use MATLAB to evaluate the following expression:

$$\frac{x^2 y^3}{(x - y)^2}$$

```
» x = 3;  
» y = 4;  
» res = x^2 * y^3 / (x - y)^2  
res =  
    576
```

Play with Variables

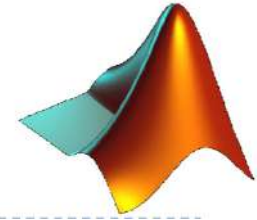


The distance traveled by a ball falling in the air is given by the equation

$$x = x_0 + v_0t + \frac{1}{2}at^2$$

Use MATLAB to calculate the position of the ball at time $t = 5$ s if $x_0 = 10$ m, $v_0 = 15$ m/s, and $a = -9.81$ m/sec².

```
» t = 5;  
» x0 = 10;  
» v0 = 15;  
» a = -9.81;  
» x = x0 + v0 * t + 1/2 * a * t^2  
x =  
-37.6250
```



Vector Exercises

- ▶ Create vector a of 9 elements
- ▶ Add 2 to each element and name this vector as b
- ▶ Take square of each element
- ▶ Create a new vector c formed by multiplying each element of b by 2

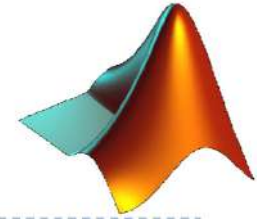
Solution

```
>>a=[1 2 3 4 5 6 4 3 4 5]
```

```
>> b=a+2
```

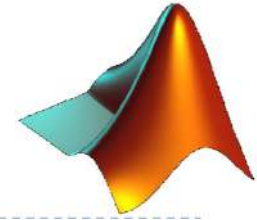
```
>> b.^2
```

```
>> c=b * 2
```



Matrix Exercises

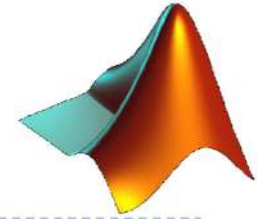
- ▶ 1. Create matrix, A , of order 3,3
- ▶ 2. Take it's transpose and name it B
- ▶ 3. Multiply A and B and assign to C
- ▶ 4. Multiply corresponding elements of A with those of B
- ▶ 5. Add A and B and assign to D
- ▶ 6. Subtract B from A and assign result to D
- ▶ 7. Take inverse of A and name it X
- ▶ 8. Illustrate the fact that a matrix multiplied by it's inverse is identity matrix
- ▶ 9. Take square of matrix A
- ▶ 10. Find 4th power of matrix B
- ▶ 11. Create matrix of order 3,3 with each diagonal element=1



Matrix Exercises Solution

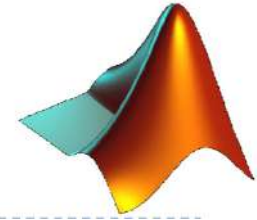
- ▶ `A=[1 2 0; 2 5 -1; 4 10 -1]` %create matrix of order 3,3
- ▶ `B=A'` %take it's transpose
- ▶ `C=A * B` %multiply A and B and assign to C
- ▶ `C=A .* B` %multiply corresponding elements of A with those of B
- ▶ `D=A + B` %add A and B and assign to D
- ▶ `D=A - B` %subtract B from A and assign result to D
- ▶ `X=inv(A)` % Take inverse of A
- ▶ `I=inv(A) * A` %Illustrate the fact that a matrix multiplied by it's inverse is identity matrix
- ▶ `A.^2` %Take square of matrix A
- ▶ `B.^4` %Find 4th power of matrix B
- ▶ `diag([ones(1,3)])` %create matrix of order 3,3 with each diagonal element=1

2D Plot Exercises



1. Plot x versus y for $y = \sin(x)$. Let x vary from 0 to 2π in increments of 0.1π .
2. Add a title and labels to your plot.
3. Plot x versus y_1 and y_2 for $y_1 = \sin(x)$ and $y_2 = \cos(x)$. Let x vary from 0 to 2π in increments of 0.1π . Add a title and labels to your plot.
4. Re-create the plot from Exercise 3, but make the $\sin(x)$ line dashed and red. Make the $\cos(x)$ line green and dotted.
5. Add a legend to the graph in Exercise 4.
6. Adjust the axes so that the x -axis goes from -1 to $2\pi + 1$ and the y -axis from -1.5 to $+1.5$.
7. Create a new vector, $a = \cos(x)$. Let x vary from 0 to 2π in increments of 0.1π . Plot just a without specifying the x values (`plot(a)`) and observe the result. Compare this result with the graph produced by plotting x versus a .

2D Plot Solutions



```
1. clear,clc
   x = 0:0.1*pi:2*pi;
   y = sin(x);
   plot(x,y)

2. title('Sinusoidal Curve')
   xlabel('x values')
   ylabel('sin(x)')

3. figure(2)
   y1 = sin(x);
   y2 = cos(x);
   plot(x,y1,x,y2)
   title('Sine and
         Cosine Plots')
   xlabel('x values')
   ylabel('y values')

4. figure(3)
   plot(x,y1,'-- r',
        x,y2,': g')
   title('Sine and Cosine
         Plots')
   xlabel('x values')
   ylabel('y values')

5. legend('sin(x)', 'cos(x)')

6. axis([-1,2*pi+1,
        -1.5,1.5])

7. figure(4)
   a = cos(x);
   plot(a)
```

A line graph is created, with a plotted against the vector index number.