Topic: Experiment - 1 Date: 20/3/23

Ananta 22/3/23

*. Aim:- Installation of Scilab and demonstration of simple programming concepts like matrix multiplication (scalar and vector), loop, conditional statements and plotting.

*. Theory:-

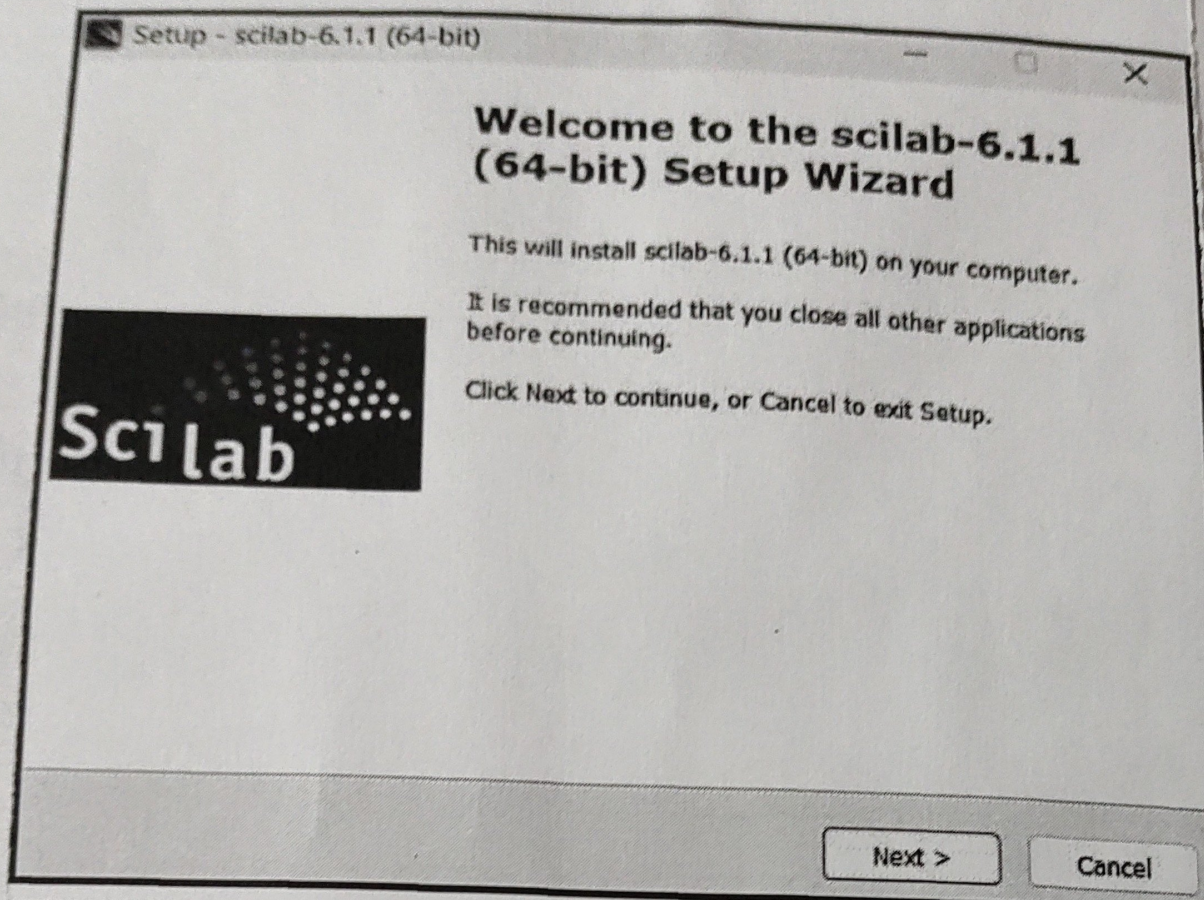
Steps to install Scilab:-

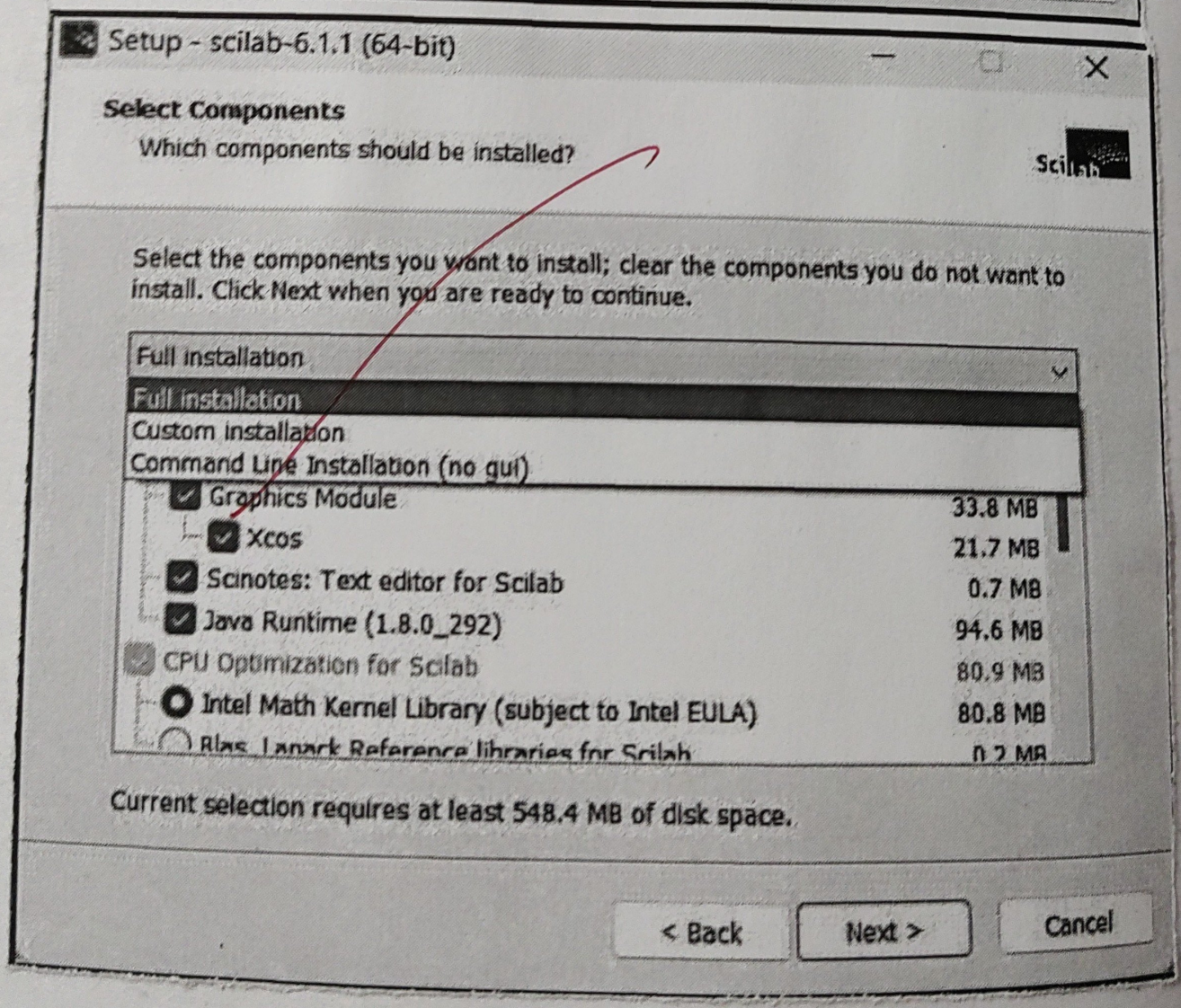
Scilab is a free and open-source, cross-platform numerical computational package and high level numerically oriented programming language. It can be used for signal processing, statistical analysis, image enhancement, fluid dynamics simulations, numerical optimization and modeling, simulation of explicit and implicit dynamical system and symbolic manipulations.

Steps:-

1. Open browser and search for Scilab
2. Using Scilab.org, install and download the latest version (32 bit or 64 bit as per the system requirement).
3. Run *.exe file.
4. Select language for installation process (English).
5. Launch Scilab setup wizard.
6. Read and Accept the Licence agreement.
7. Select the folder from your local hard drive where you want to install.
8. Select "full installation" in type of installation.
9. Review all installation settings and click on install.
10. Wait for the installation to complete, setup finished.

INSTALLATION OF SCILAB-6.1.1





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11. Launch Scilab.

*. Scilab v/s Matlab

Scilab	MATLAB
• It is a software used for performing scientific computation.	• It is a high level programming language used for performing mathematical computing.
• This language / software is programmed with C, C++ and Fortran.	• This language / software is written in C, C++ and Java.
• The command line used begins with '//'.	• The command line used begins with '%'.
• It is open source software.	• It is not open source software.
• The syntax for declaring empty matrix is [] + 1.	• The syntax for declaring empty matrix is [].

*. Operations

Matrix Multiplication :-

a = [1 2 ; 3 -4]

b = [4 5 ; -1 0]

→ a.*b = [4 10 ; -3 0] = $\begin{bmatrix} 4 & 10 \\ -3 & 0 \end{bmatrix}$

→ a*b = $\begin{bmatrix} 2 & 5 \\ 16 & 15 \end{bmatrix}$

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for loop :-

```
// printing no. 1 to 10
for i = 1:10
    disp(i);
end
```

```
// syntax
for variable = expression
    instruction;
end
```

while loop :-

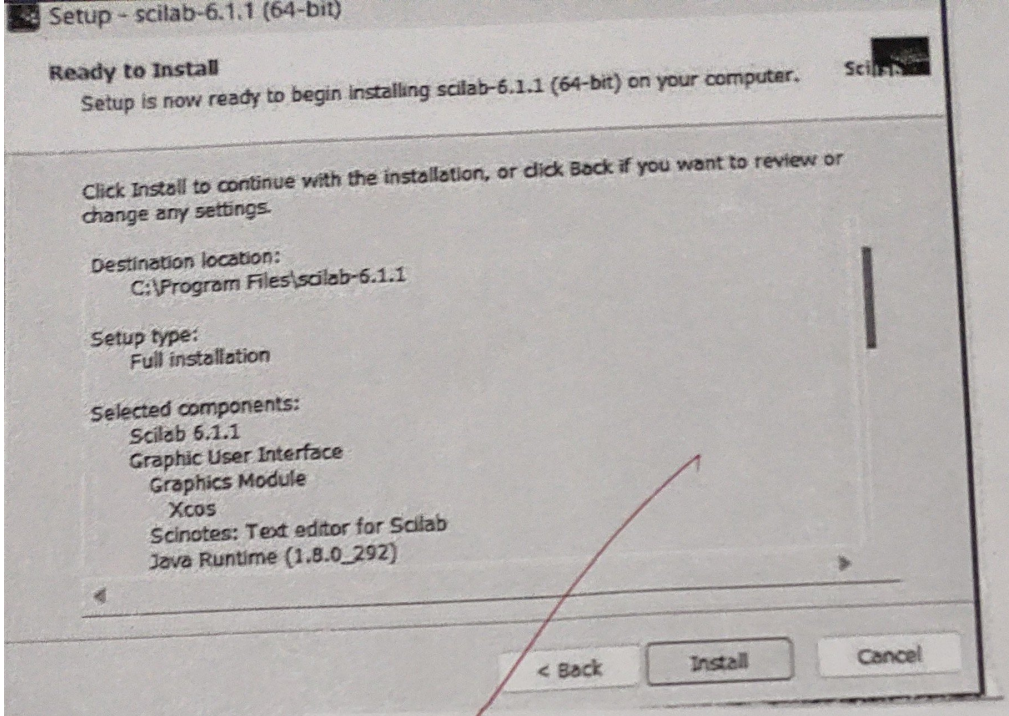
```
// printing no. 1 to 10
j=1
while (j<11)
disp (j);
j = j+1;
end
```

```
// syntax
while (condition)
    instruction;
end
```

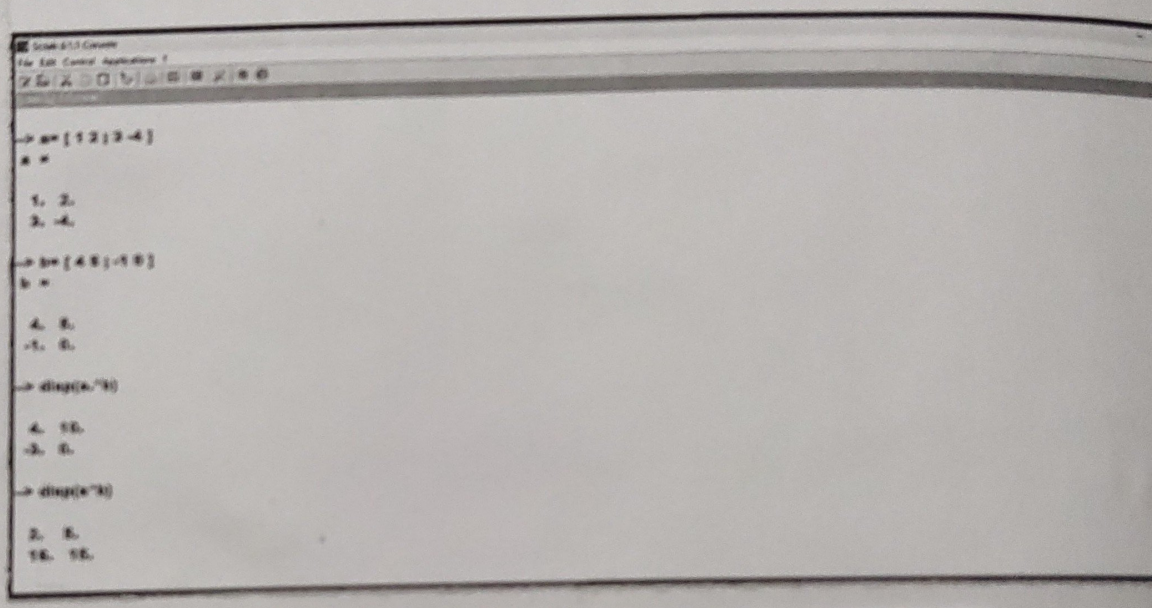
do-while loop :-

```
// printing no. 1 to 10
i = 1
while (i<11) do
disp (i);
i = i+1;
end
```

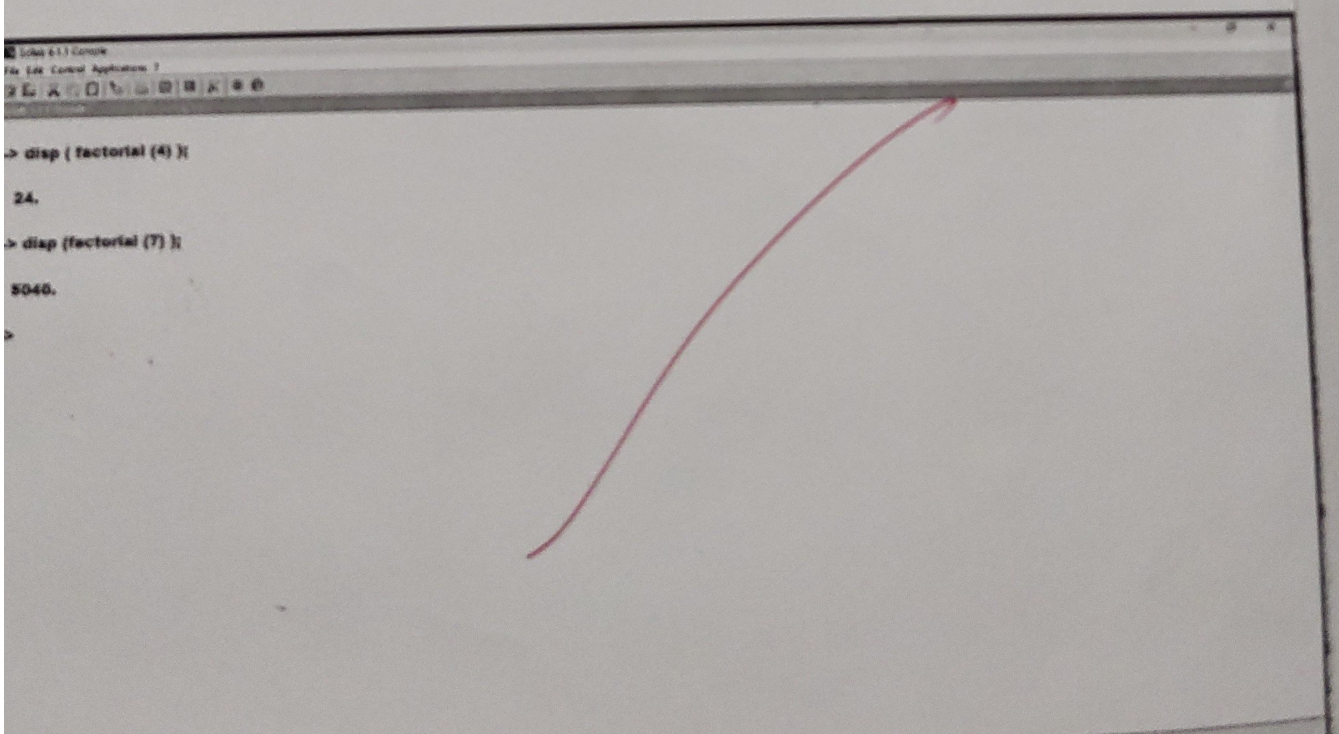
```
// syntax
initialise variable
while (condition) do
    instruction;
end
```



MATRIX MULTIPLICATION



FACTORIAL



FOR LOOP

```
--> for i = 1 : 10
 > disp ( i );
 > end

 1.

 2.

 3.

 4.

 5.

 6.

 7.

 8.

 9.

 10.
```

WHILE LOOP

```
--> i = 1;

--> while ( i < 11)
 > disp ( i );
 > i= i + 1;
 > end

 1.

 2.

 3.

 4.

 5.

 6.

 7.

 8.

 9.

 10.
```

DO WHILE LOOP

```
--> i = 1;

--> while ( i < 11 ) do
 > disp ( i );
 > i = i + 1;
 > end

 1.

 2.

 3.

 4.

 5.

 6.

 7.

 8.
```

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factorial:-

// $n! = 1*2*3 \ldots *(n-1)$

// To find factorial, we have a direct function i.e. factorial

// --> factorial (4)

```
--> disp (factorial (4));
    24

--> disp (factorial (7));
    5040
```

Plotting

The plot can be done of a function by following the steps.

1. Define 'x' by specifying the range of values for the variable 'x', for which the function is to be plotted.
2. Define the function $y=f(x)$.
3. Call the 'plot' command as plot (x,y).

// plotting graph of two polynomials

```
x = [-10 : 0.01 :10];
y = 3*x.^4 + 2*x.^3 + 7*x.^2 + 2*x + 9;
g = 5*x.^3 + 9*x + 2;
plot (x,y,'r',x,g,'b');
```

Topic: Experiment -2 Date: 17/3/23

Thanks 3/4/23

* Aim:- Finding of binomial distributions for given n and p.

* Theory:-

In probability theory and statistics, the binomial distribution is the discrete probability distribution that gives only two possible results in an experiment, either success or failure. For example, if we toss a coin, there could be only two possible outcomes: heads or tails, and if any test is taken then there could be only two possible results: Pass or fail. This distribution is also called a Binomial Distribution.

* Binomial Distribution formula

$$P(x:n,p) = {}^nC_x p^x (1-p)^{n-x}$$

where

- n = the number of experiments
- $x = 0, 1, 2, 3, 4 \ldots$
- p = Probability of success in a single experiment.
- q = Probability of failure in a single experiment $= 1-p$

* Binomial Distribution Mean and Variance

For a binomial distribution, the mean, the variance and standard deviation for the given number of success are represented using the formulas:-

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- Mean $\mu = np$
- Variance $\sigma^2 = npq$
- Standard deviation, $\sigma = \sqrt{npq}$

★ Syntax:-

```
function [y] = Binomial distribution (n,p)
  %.n = the number of experiments
  %.p = Probability of success in a single experiment.
  x = 0:n;
  y = binopdf (x,n,p);
  %. figure

  bar (x,y,1)
  xlabel ('Observation');
  ylabel ('Probability');
  end
```

★ Code:-

Example:- In a lot of 200 articles, 10 are defective, find the probability of
(i) no defective article
(ii) one defective article
(iii) at least one defective article ; in a random sample of 20 article.

```
clc;
clear;
format long e
n = 20;      %. total articles
p = 10/200;  %. probability of defective items
```

OUTPUT

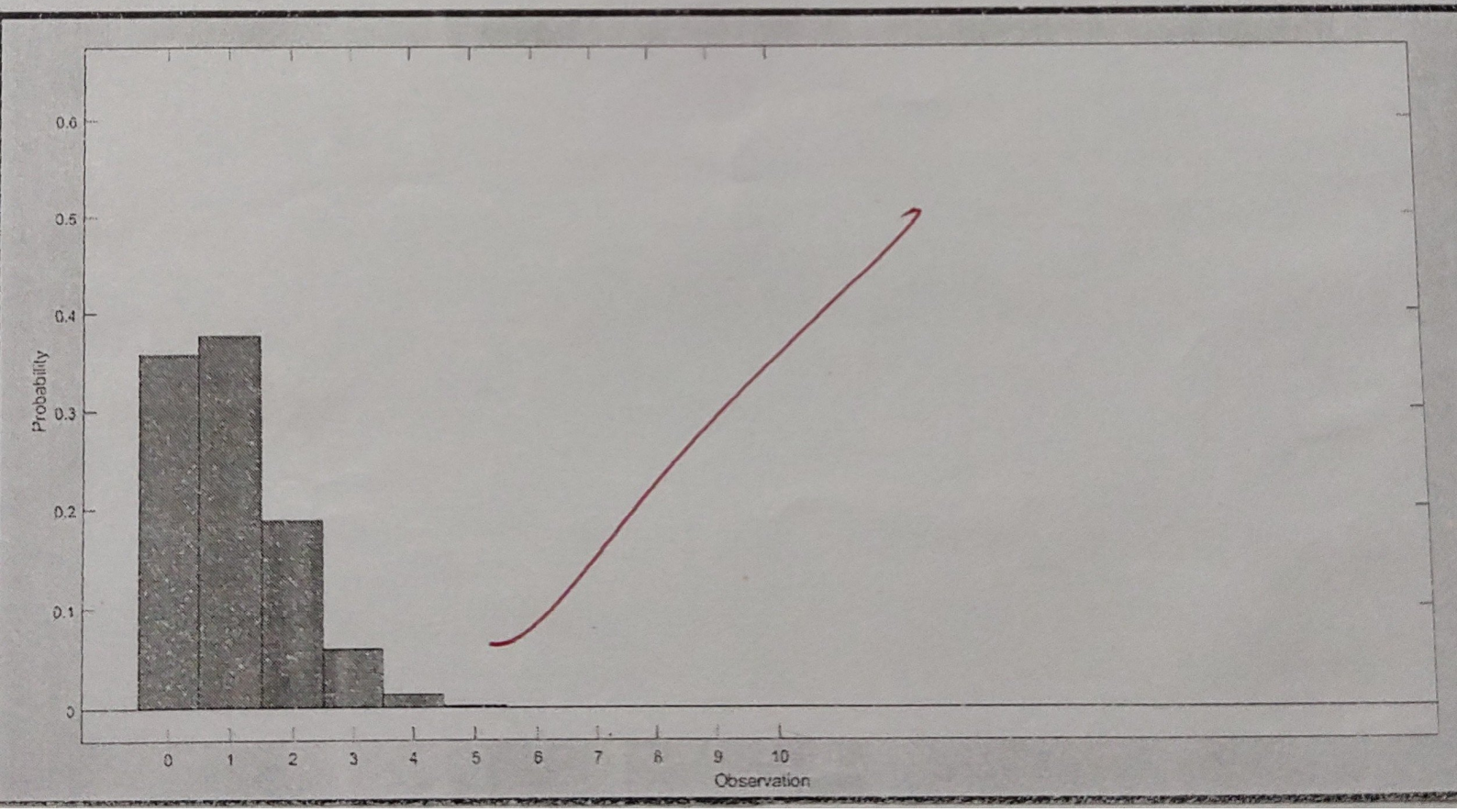
Command Window

```
>> pj
Probability of no defective article is
     3.584859224085419e-01

Probability of one defective article is
     3.773536025353076e-01

Probability of at least one defective article is
     6.415140770534977e-01

fx >>
```



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```
x = 0:10;
prob = 0;
y = binopdf (x,n,p);
%% (i) probability of no defective article out of 20
fprintf ('Probability of no defective article is ');
fprintf ('\n');
disp (y(1));

%% (ii) probability of one defective article out of 20
fprintf ('Probability of one defective article is ');
fprintf ('\n');
disp (y(2));

%% (iii) probability of atleast one defective articles out of 20
for i = 2:11
    prob = prob + y(i);
end
fprintf ('Probability of atleast one defective article is ');
fprintf ('\n');
disp (prob);

%% plotting
bar(x,y,1)
xlabel ('Observation');
ylabel ('Probability');
```

Topic Experiment - 3 Date 3/04/23

Ananth 10/4/23

* Aim:- Finding of binomial distribution after computing mean and variance.

* Theory:-
In probability theory and statistics, the binomial distribution is the discrete probability distribution that gives only two possible results in an experiment, either success or failure. For example, if we toss a coin, there could be only two possible outcomes: Head or Tail and if the test is taken, there could be only two results: pass or fail. This distribution is also called a binomial probability distribution.

* Binomial distribution Mean and Variance
For a binomial distribution, the mean, variance and the standard deviation for the given number of success are represented using the formulas.

- Mean, $\mu = np$
- Variance, $\sigma^2 = npq$
- Standard deviation, $\sigma = \sqrt{npq}$

Example:-
If the probability of a defective bolt is 0.1, find
a) the mean
b) the standard deviation for the distribution bolts in a total of 500.

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CODE:- We constructed a function file named 'example 2'.

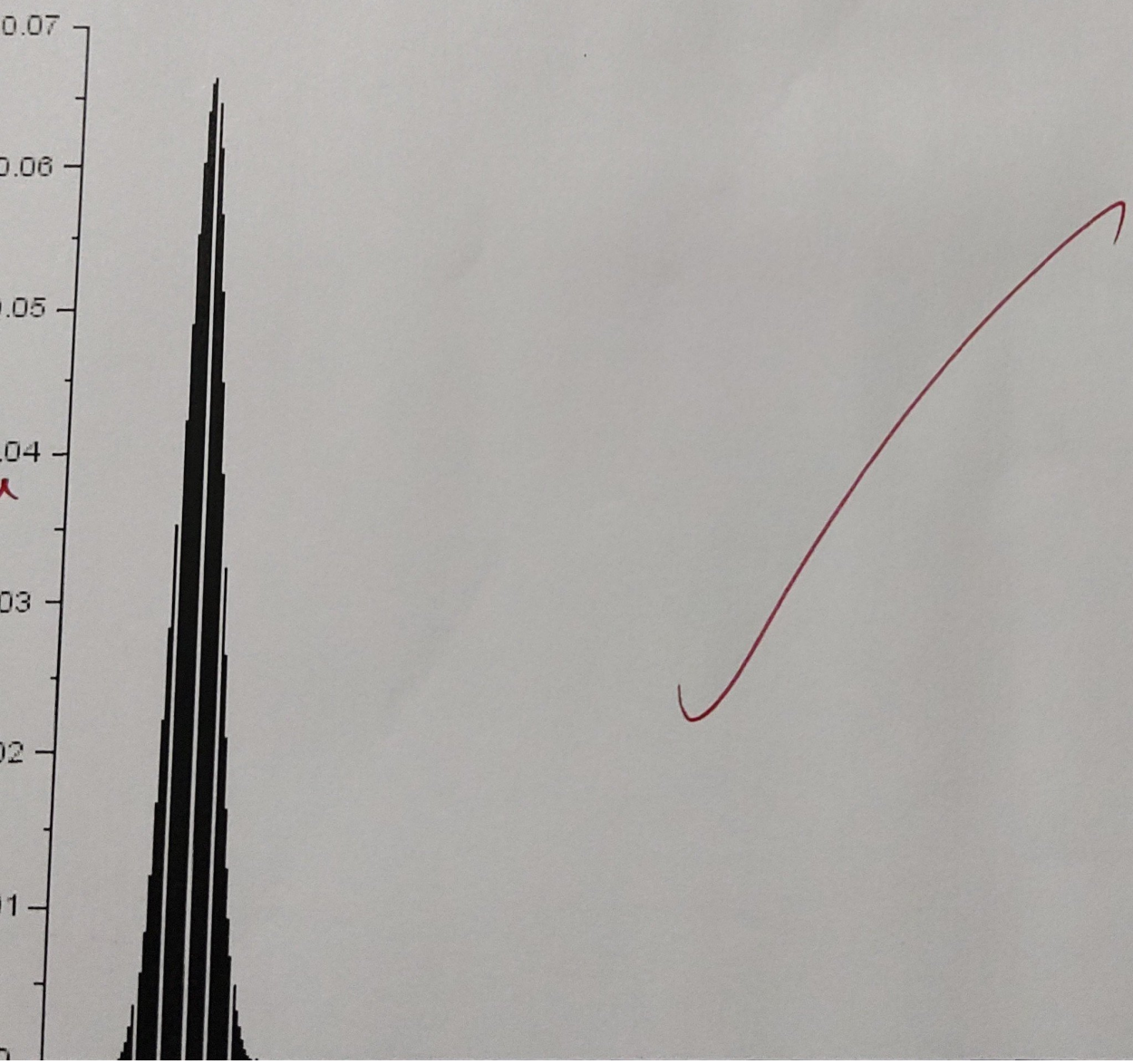
```
function [mean, variance, SD] = example 2 (n,p)
% n = the number of experiments
% p = Probability of Success in a single experiment.
%% Mean, Variance and Standard deviation is computed.

mean = n*p;
variance = n*p*(1-p);
SD = sqrt(variance);

x = 0:n;
y = binopdf (x,n,p);

bar(x,y,1);

xlabel ('observation');
ylabel ('Probability');
end
```

riable Browser

Name	Value	Type	Visibility
SD	6	Double	
mean	40	Double	
n	400	Double	
p	0.1	Double	
variance	36	Double	

ools Edit ?

window number 0



Topic: Experiment - 4

Date: 17/4/23

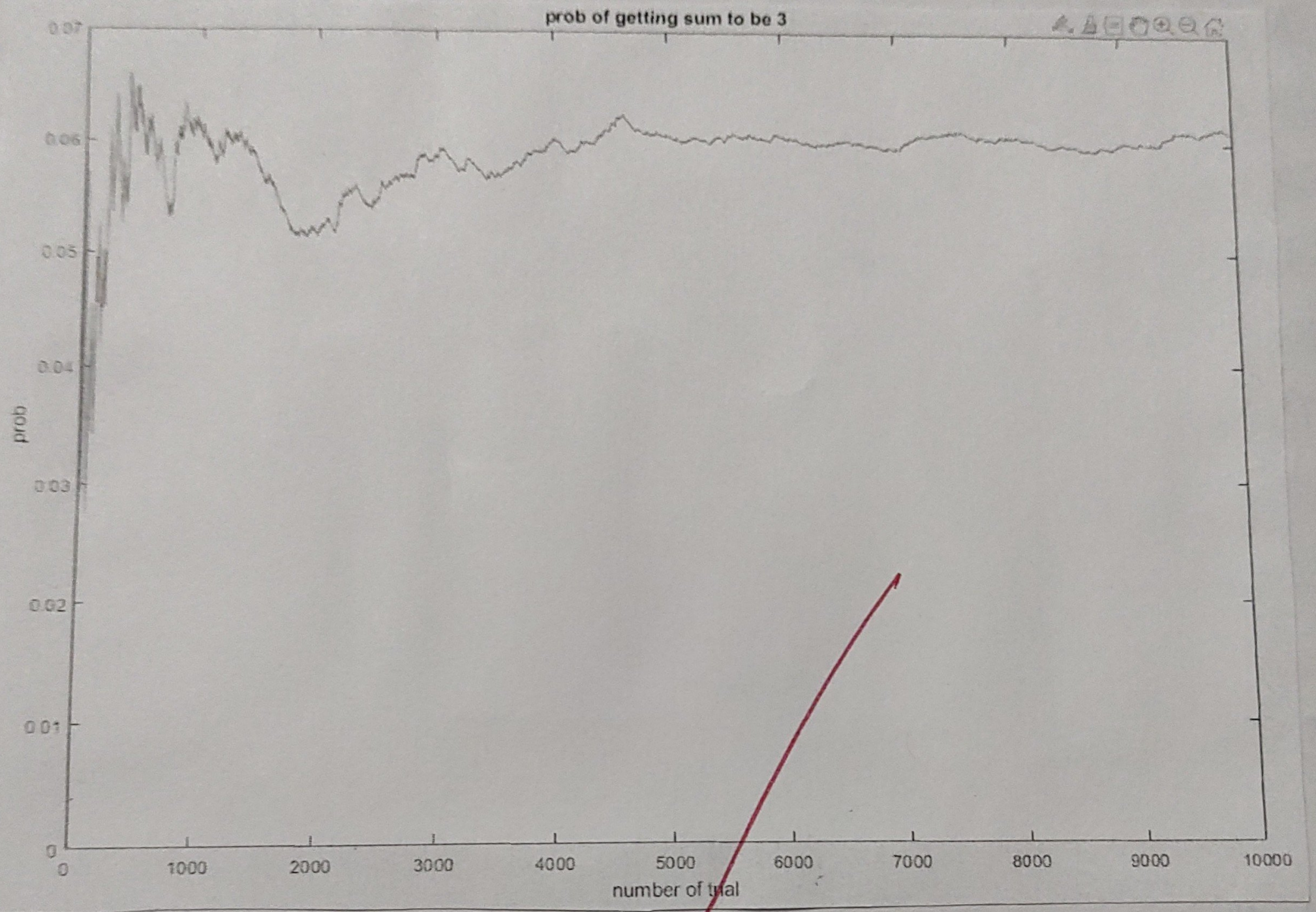
*. Aim:- Program for demonstration of theoretical probability limits.

*. Theory:-

The probability limit also known as the limit of a sequence of probabilities is a concept in probability theory that describes the behaviour of a sequence of events as the number of trials goes to infinity. As the number of trials increases, the probability of an event tends to a certain limit. This limit can either be zero, indicating that the event is highly unlikely, or one, indicating that the event is almost certain to occur. The concept of probability limit is important in many areas of mathematics and statistics, including the study of random processes and the behaviour of statistical estimators.

Code:-

```
N = 10000;
  count = 0;
  for i = 1:N
      y1 = ceil(rand(1)*6);
      y2 = ceil(rand(1)*6);
      if ((y1+y2) == 3)
          count = count+1;
      end
          prob1(i) = count/i;
end
```


prob of getting sum to be 3
prob
number of trial
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000

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```
plot (prob1)
xlabel ('Number of trial');
ylabel ('prob');
title ('prob of getting sum to be 3');
```

Topic: Experiment - 5 Date: 17/4/23

Aparna 24/4

★ Aim:- Program to plot the normal distribution and Exponential distribution for various parameter values.

★ Theory:-

Normal distribution:-

Normal distribution is also known as the Gaussian distribution, is a probability distribution that is symmetric about the mean, showing that the data near the mean are more frequent in occurence than data far from the mean.

In graphical form, the normal distribution appears as "bell curve".

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

$f(x)$ = probability density fun^n
σ = standard deviation
μ = mean.

Exponential distribution:-

It is a continuous probability distribution that often concerns the amount of time until some specific event happens. It is a process in which events happen continuously and independently at a constant avg rate.

$$f(x;\lambda) = \begin{cases} \lambda e^{-\lambda x} & ; x \geq 0 \\ 0 & ; x < 0 \end{cases}$$

$f(x;\lambda)$ = probability density fun^n
λ = rate parameter
x = random variable

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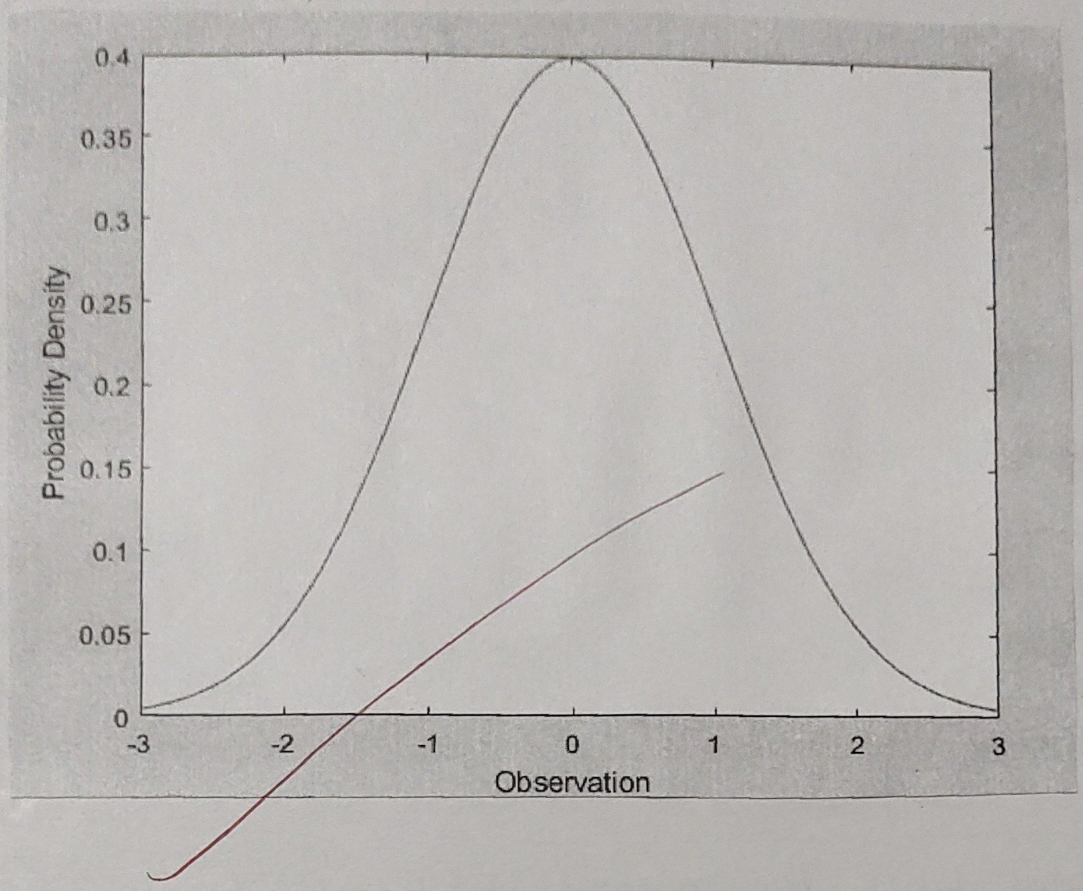
* Normal Distribution

```
x = [-3 : 0.1 : 3];
y = normpdf (x,0,1);
plot (x,y);
xlabel ("Observation");
ylabel ("Probability density");
```

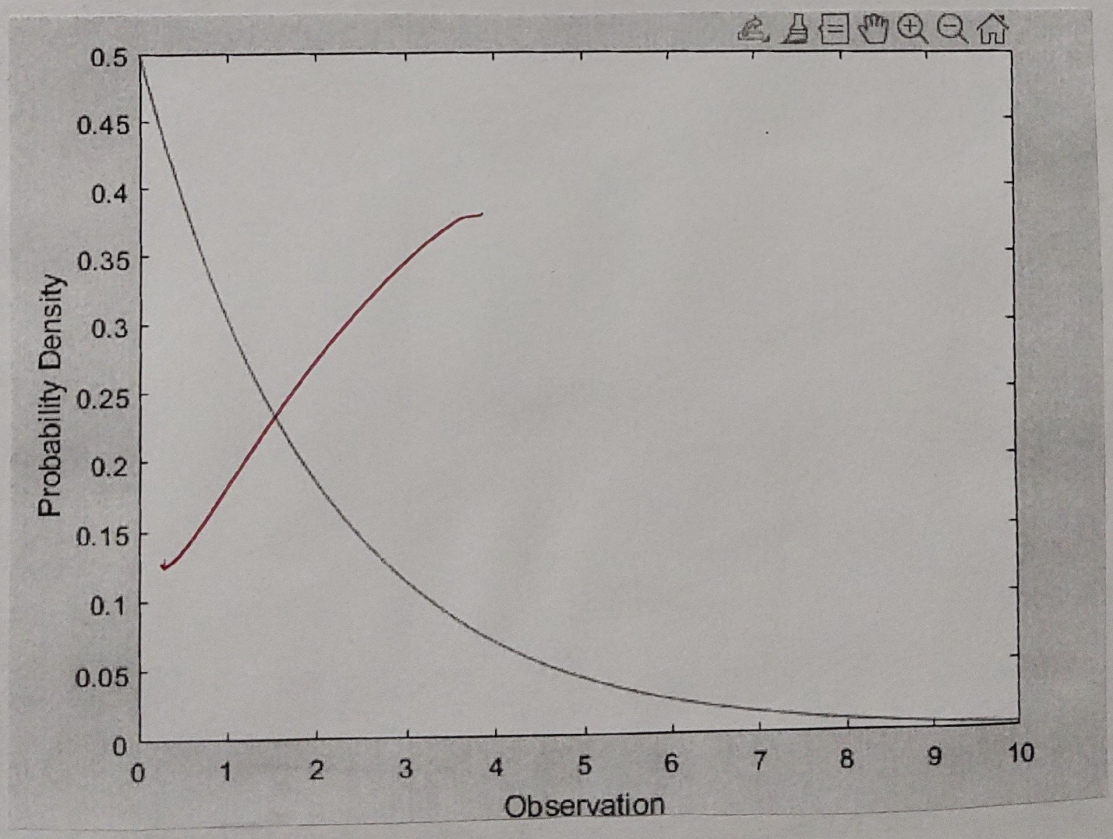
* Exponential Distribution

```
x = 0 : 0.1 : 10;
y = exppdf (x,2);
plot (x,y);
xlabel ("Observation");
ylabel ("Probability density");
```

NORMAL DISTRIBUTION



EXPONENTIAL DISTRIBUTION



Topic Experiment -6 Date 24/4/23

* Aim:- Finding of poission distribution for given value of lambda.

* Software used:- MATLAB

* Theory:-

The poission distribution is a one-parameter family of curves that models the number of times a random event occurs. The distribution is appropriate for applications that involve counting the number of times a random event occurs in a given amount of time, distance, area and so on.

The formula for the Poission distribution function is given by:-

$$f(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

where,

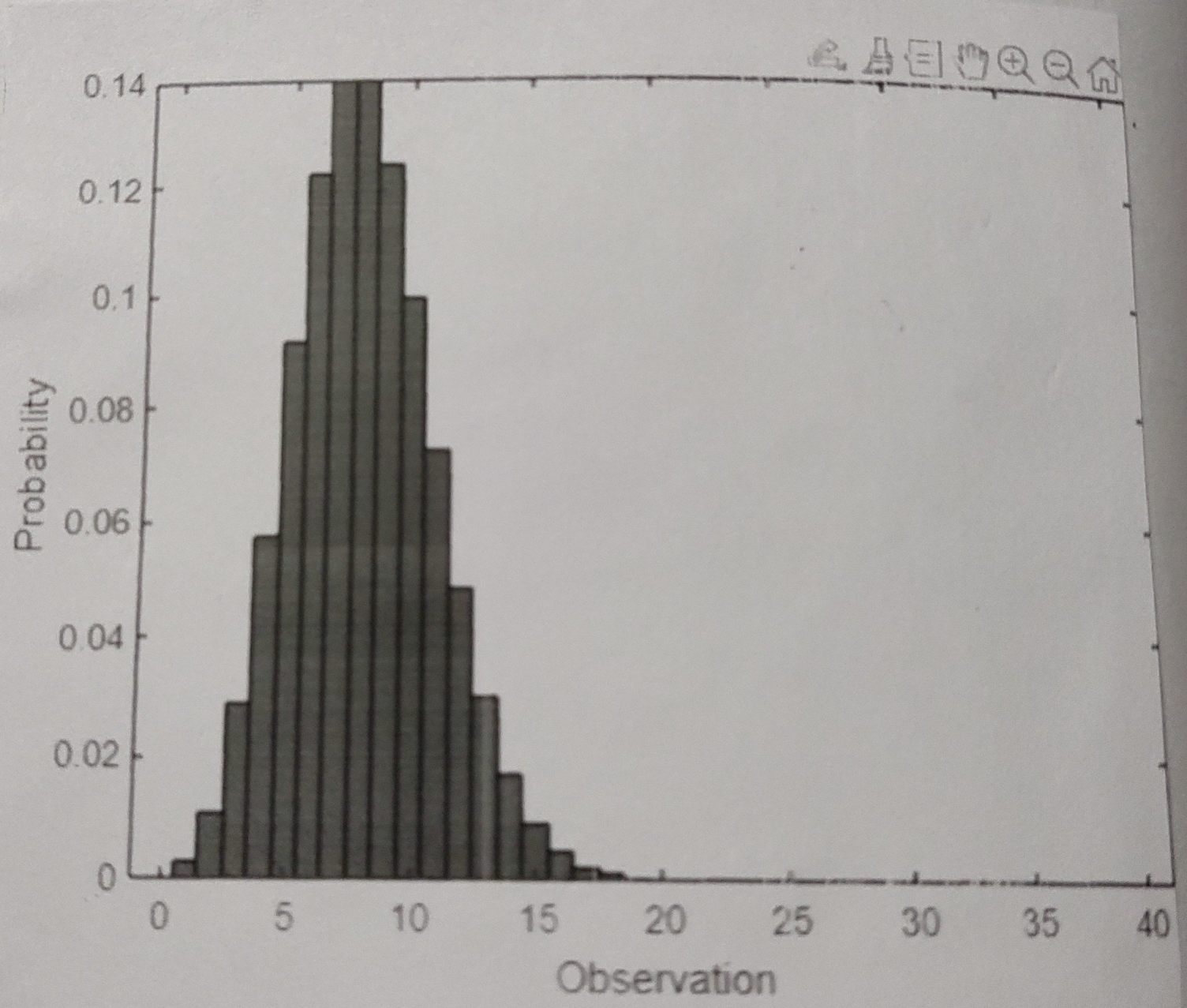
e is the base of the logarithm.

x is the Poission random variable.

λ is the average rate of value.

In MATLAB, we can perform poission distribution using the "poisspdf" function.

$\boxed{\text{poisspdf}(x, \text{lambda})}$


0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Probability
0
5
10
15
20
25
30
35
40
Observation

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Compute the Poission Distribution pdf.

```
x = 0:40
y = poisspdf (x,8);
figure
bar(x,y,1);
xlabel ('Observation')
ylabel (' Probability')
```

Topic: Experiment - 7

Date: 1/5/23

* Aim :- Fitting of Poisson distribution after computing mean.

* Software used :- MATLAB

* Theory :-

The formula for the mean of Poisson Distribution is given by :-

$$E(x) = \lambda$$

The formula for the variance of the Poisson Distribution is given by :-

$$V(x) = \lambda$$

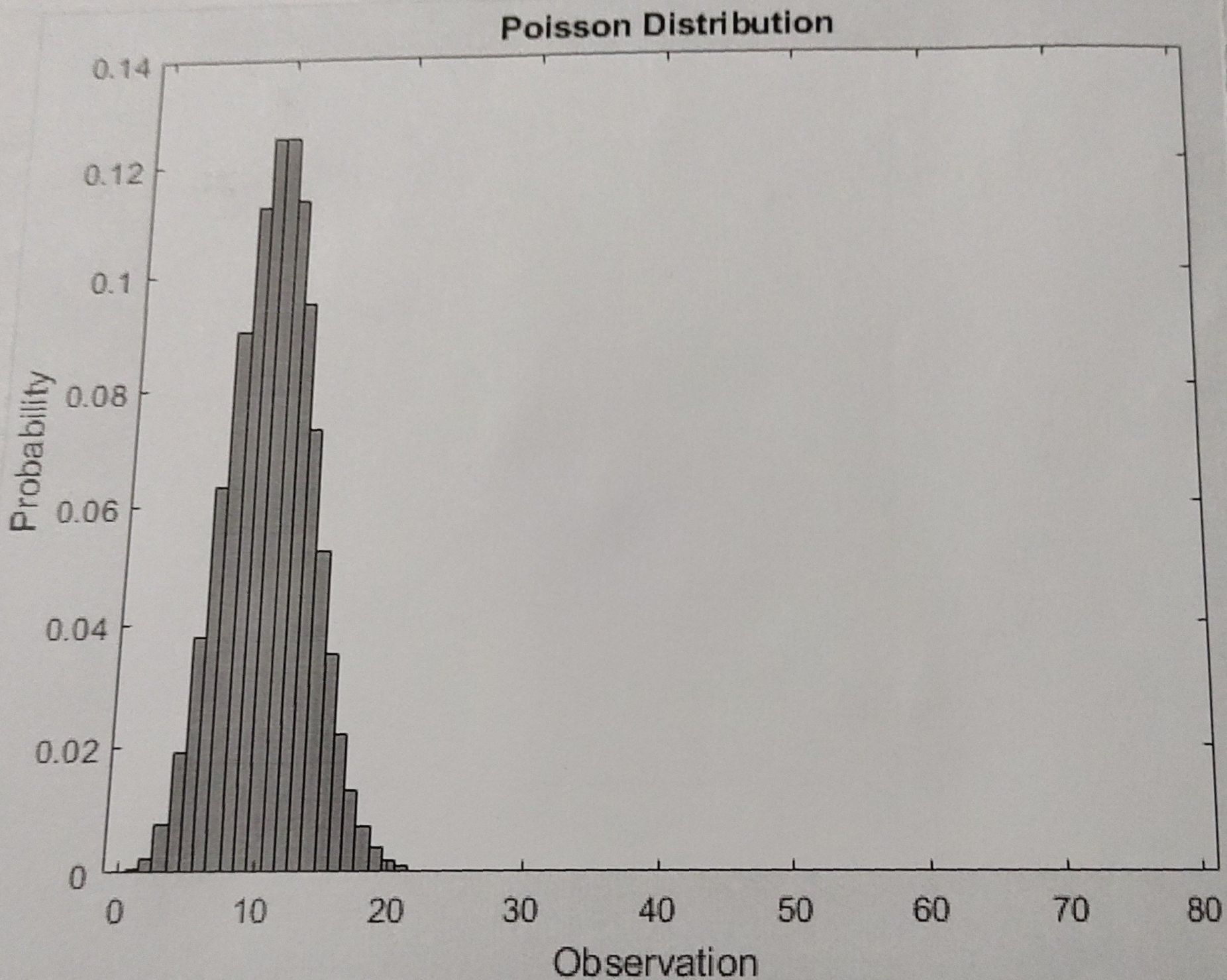
In MATLAB, you can compute the mean and variance of the Poisson distribution using "Poisstat" function.

m = poisstat (lambda)

It returns the mean of the Poisson distribution using mean parameters in lambda.

* Code :-

```
x = 0:80;
lambda = 15;
mean = poisstat (lambda);
y = poisspdf (x, mean);
figure;
bar (x,y,1);
title ('Poisson distribution');
xlabel ('Observation')
ylabel ('Probability');
```


Poisson Distribution
Probability
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
10
20
30
40
50
60
70
80
Observation

Topic: Experiment-8 Date: 09/5/23

* Aim:- Finding of normal distribution when parameters are given.

* Theory:-

The normal distribution is a continuous probability distribution that is symmetric and characterized by its mean (μ) and standard deviation (σ). The probability density function (PDF) of a normal distribution is given by:-

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

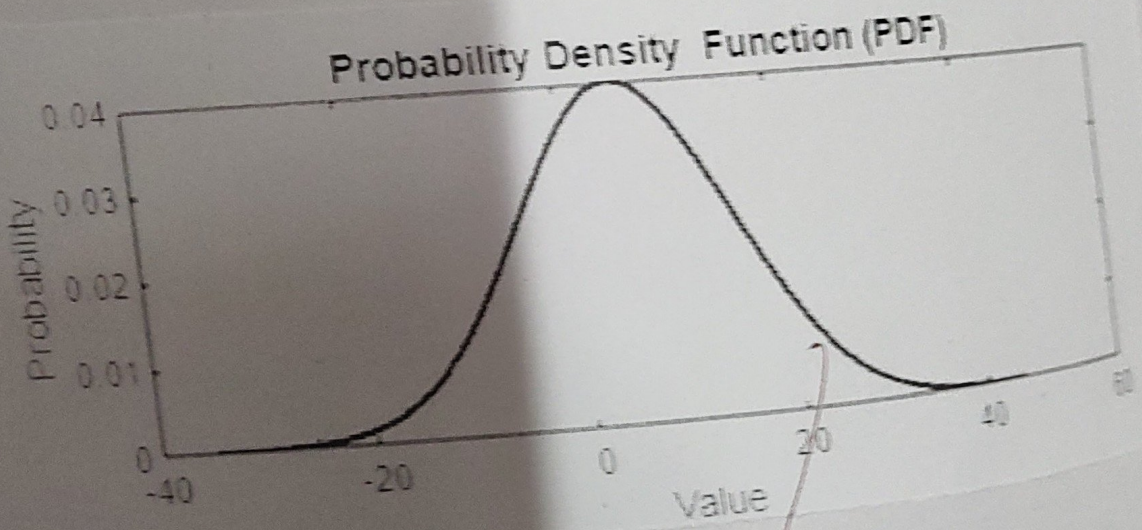
where x represents the variable, μ is the mean, σ is the standard deviation, π is the mathematical constant and exp is the exponential function.

In the MATLAB code, the 'normpdf' function is used to calculate the PDF values of the normal distribution for a given range of values, given the mean and standard deviation.

* Code:-

```
meanValue = input ("Enter the value of mean");
stdDeviation = input ("Enter the value of standard deviation);
x = linspace (meanValue - 4 * stdDeviation , meanValue +
            4* stdDeviation , 100);
```

Mean value = 5
StdDeviation = 10



```
pdfValues = normpdf (x, meanValue, stdDeviation);

subplot (2,1,1);
plot (x, pdfValues, 'b', 'linewidth', 2);
title ('Probability density function');
xlabel ("Value");
ylabel ("Probability");
```