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Expt. No. Page No. 1

Introduction to digital Image processing

- Digital image processing (DIP) is the manipulation of digital images using computer algorithms it involves enhancing the image quality, correcting distortions and extracting information.

- Digital image processing involves following key steps.

1) Image Acquisition: capture of digital image

2) Pre-Processing: TO correct distorations, reduce noice enhance overall quality.

3) Image segmentation: It involves dividing an image into meanigful regions.

4) feature extraction: It allows the extraction of relevant information or the feature of the image.

5) Object recognition and classification: DIP plays a vital role in automate object regonition and classification.

- DIP has a wide range of applications across various levels and fields:-

1) Medical Imaging: DIP is extensively used in medical diagnostics through techniques such as image segmentation.

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* Satellite image processing: Remote sensing satellites capturing vast amounts of imagery for applications like environmental monitoring etc.

* Biometrics: Facial recognition, fingerprint analysis, and iris scanning utilize DIP for the feature extraction and pattern recognition.

Introduction to MATLAB

Matlab also known as Matrix lab, is a high level prog. language and environment primarily designed for numerical computing and data analysis.
Developed by Mathworks, Matlab is widely used in academics, engineering and various scientific disciplines. It is go to choice for researchers, engines and scientists working in diverse domains.

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→ Representation of RGB and Grayscale images

```
A = imread ('C:\Users\student\Desktop\Rahul\Panda.jpg');

subplot (2,1,1);

imshow (A);
title ('colour image');

B = rgb2gray(A);
subplot (2,1,2);
imshow (B);
title ('Grayscale Image');
```

→ Matrix operations in MATLAB

```
a = [1 2 3 4];
a

b = [1; 2; 3; 4];
b
C = [1 2 3; 4 5 6; 7 8 9 0];
C
```

→ Slicing operations

```
C (7:2, 2:3)
```

a = [1 2 3 4]

b: $\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$

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→ Addition of Matrix :

```
a = [1 2; 3 4]
b = [5 6; 7 8]
C = a+b
C
```

→ Subtraction of Matrix :

```
d = a - b
d
```

→ Multiplication of 2 matrices.

```
e = a * b
e
f = a .* b      // element wise multiplication
```

→ Matrix square

```
a^2
a.^2            // element wise square
```

→ division of a with b inverse

```
g = a/b;
```

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$$e = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

slicing :- $\begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$

$$a = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad b. \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} \qquad c. \begin{bmatrix} 6 & 8 \\ 10 & 12 \end{bmatrix}$$

$$d = \begin{bmatrix} -4 & -4 \\ -4 & -4 \end{bmatrix}$$

$$e = \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$$

$$f = \begin{bmatrix} 5 & 12 \\ 21 & 32 \end{bmatrix}$$

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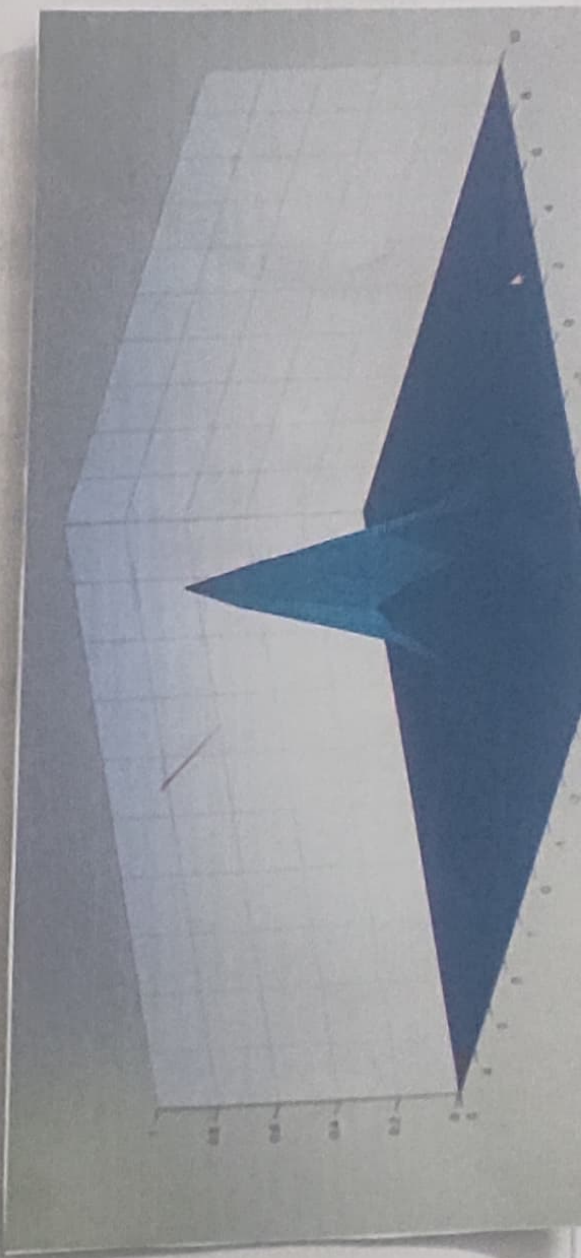
Expt. No. 1(a) Page No.

Experiment - 1(a)

Q Representation of RGB and Gray scale image.

```
A = imread ('C:\user\student\ mat.jpg');
subplot (1,2,1);
imshow (A);
title ('colowed image')
  B = rgbgray (A);
  subplot (1,2,2)
  imshow (B);
  title ('Gray scale image');
```

Teacher's Signature :



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Expt. No. 1(c)

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Experiment - 1(c)

Plot the variable y which is defined as $y = +1$ for $x < 0$ and $y = -1$ for $x >= 0$ where x is a random variable b/w -5 to 5.

```
x = randi([-5,5],1,11)
y = 5:5
for i = 1:11
 if x(i) < 0
  y(i) = 1
 end
 if x(i) >= 0
  y = 1
 end
end
plot(x,y);
```

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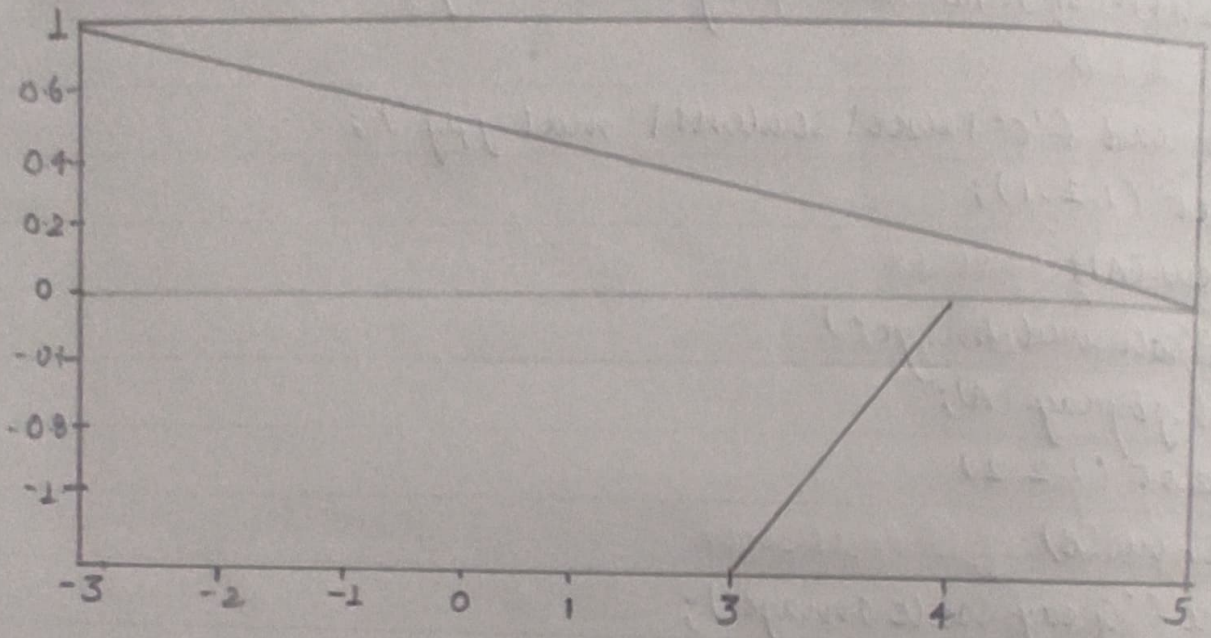
1
0.6
0.4
0.2
0
-0.4
-0.8
-1
-3
-2
-1
0
1
3
4
5

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Experiment - 16(d)

AIM: $S_1 = 1 + \frac{1}{2^2}$

$S_2 = 1 + \frac{1}{2^2} + \frac{1}{2^2}$

$S_{10} = 1 + \frac{1}{1^2} + \frac{1}{2^2} + \dots + \frac{1}{10^2}$

```
a = 1:10
a(1) = 2;
for i = 2:10
    a(i) = a(i-1) + 1/i^2;
end
a
```

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d =

Columns 1 through 6

2 3 4 5 6

Columns 7 through 10

7 8 9 10

a =

Columns 1 through 3

2.0000 2.2500 2.3611

Columns 4 through 6

2.4236 2.4636 2.4914

Columns 7 through 9

2.5118 2.5274 2.5398

Column 10

2.5498

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Expt. No. 1(e) Page No.

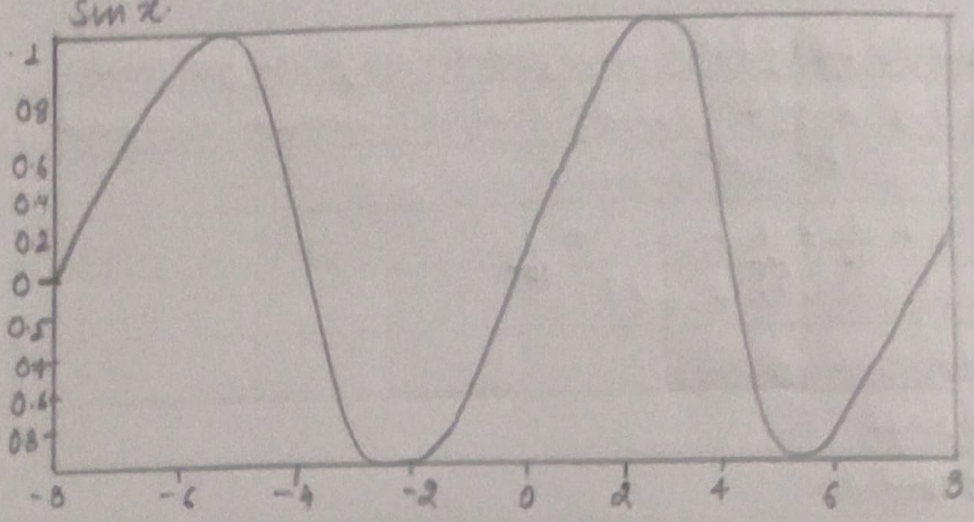
Experiment-1(e)

AIM: Plot sin x graph with differentiation in range $-2\pi < x < 2\pi$

```
x = 2*pi/pi/90 : 2*pi;
y = sin(x);
subplot(1,2,1);
plot(x,y);
dy = diff(y);
dx = diff(x);
subplot(1,2,2);
p = dy/dx;
plot(p);
```

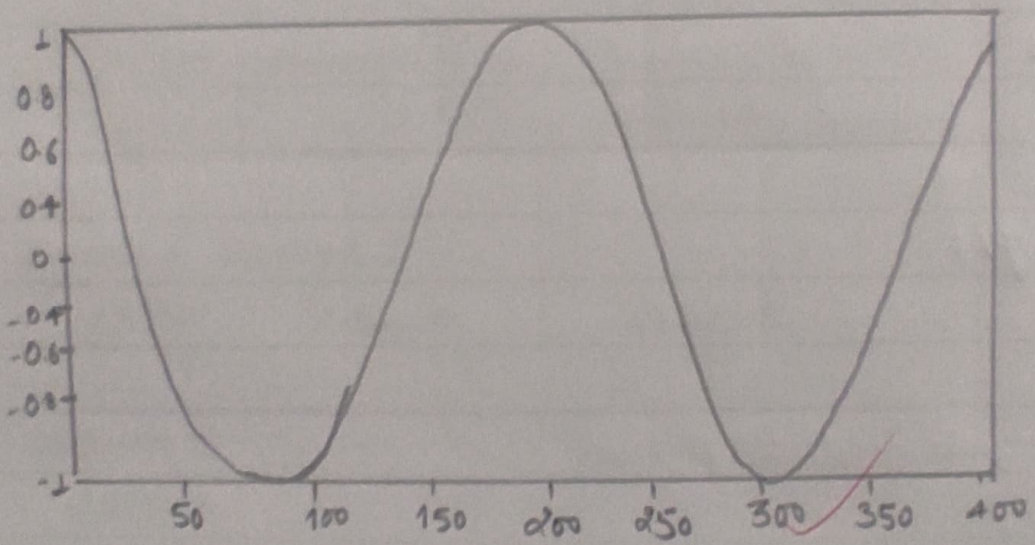
Teacher's Signature :

Sin x



cos x

differentiation



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Expt. No. 1(f)

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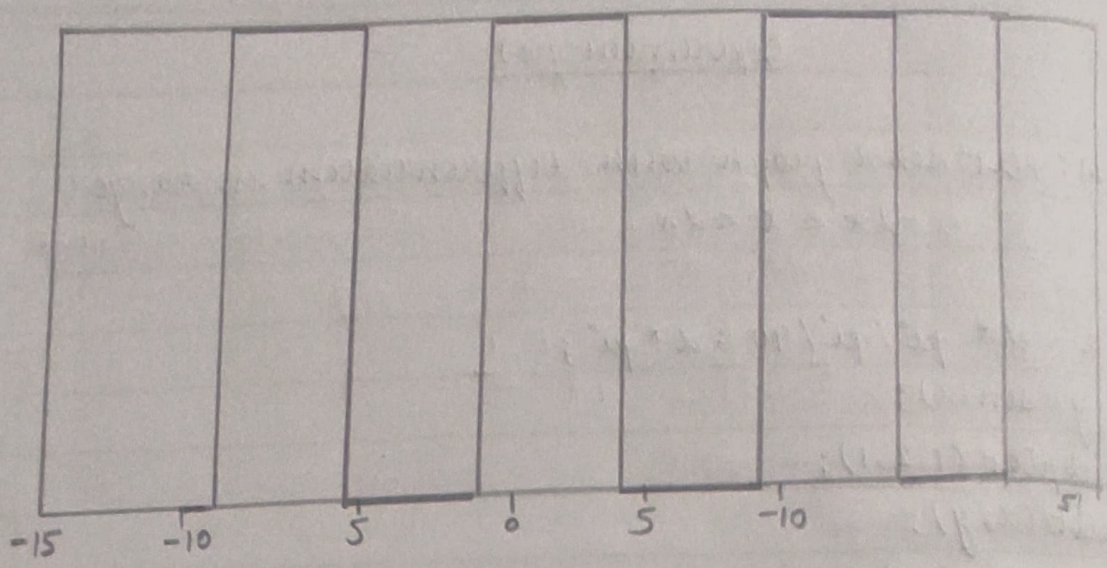
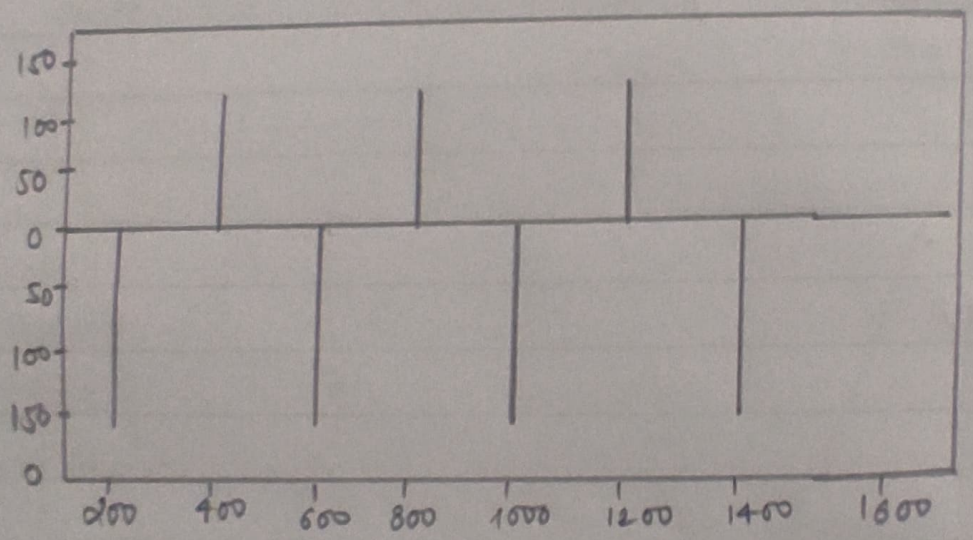
Experiment - 1(f)

AIM: Plot square waveform with respect to differentiation.

```
x = 4*pi : pi/200 : 4*pi;
y = square(x);
subplot(1,2,1);
plot(x,y);
dy = diff(y);
dx = diff(x);
p = dy/dx;
subplot(1,2,2);
plot(p);
```

Teacher's Signature :


-15
-10
5
0
5
-10


150
100
50
0
50
100
150
0
200
400
600
800
1000
1200
1400
1600

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Expt. No. 1(g)

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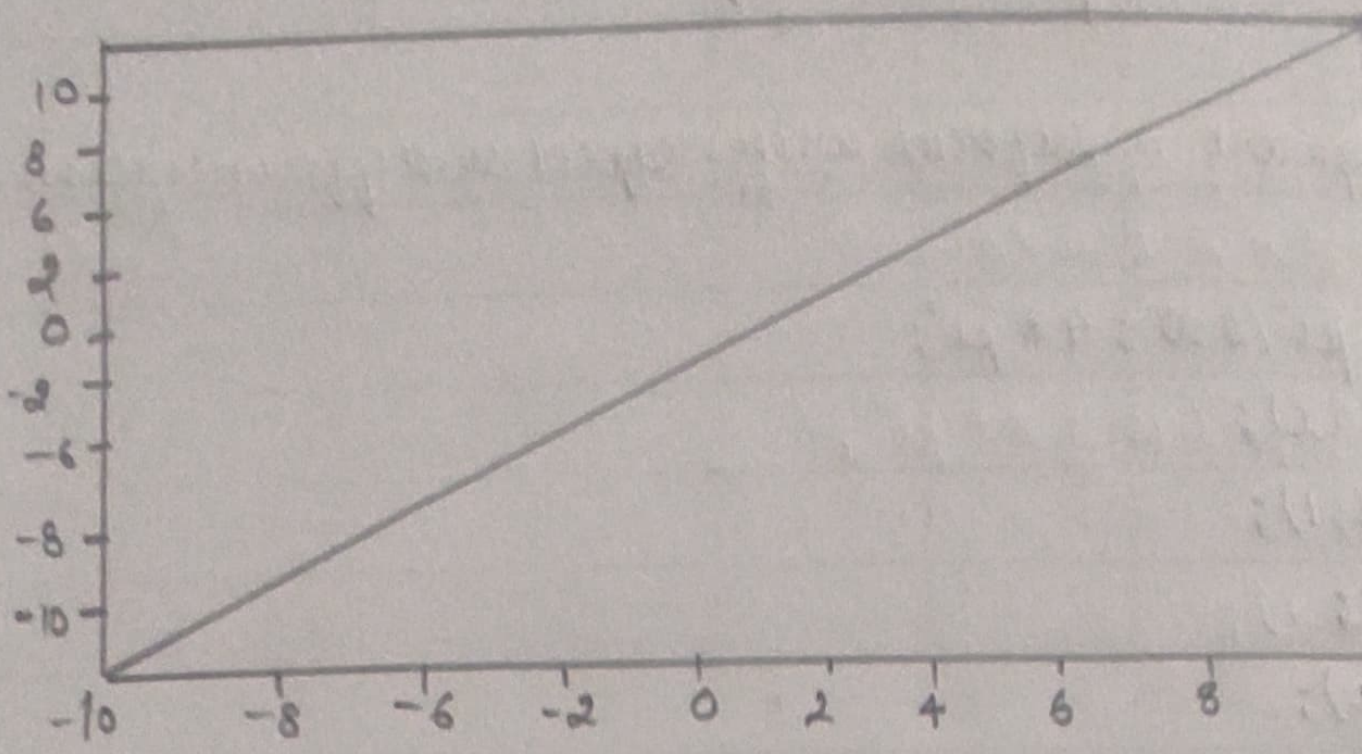
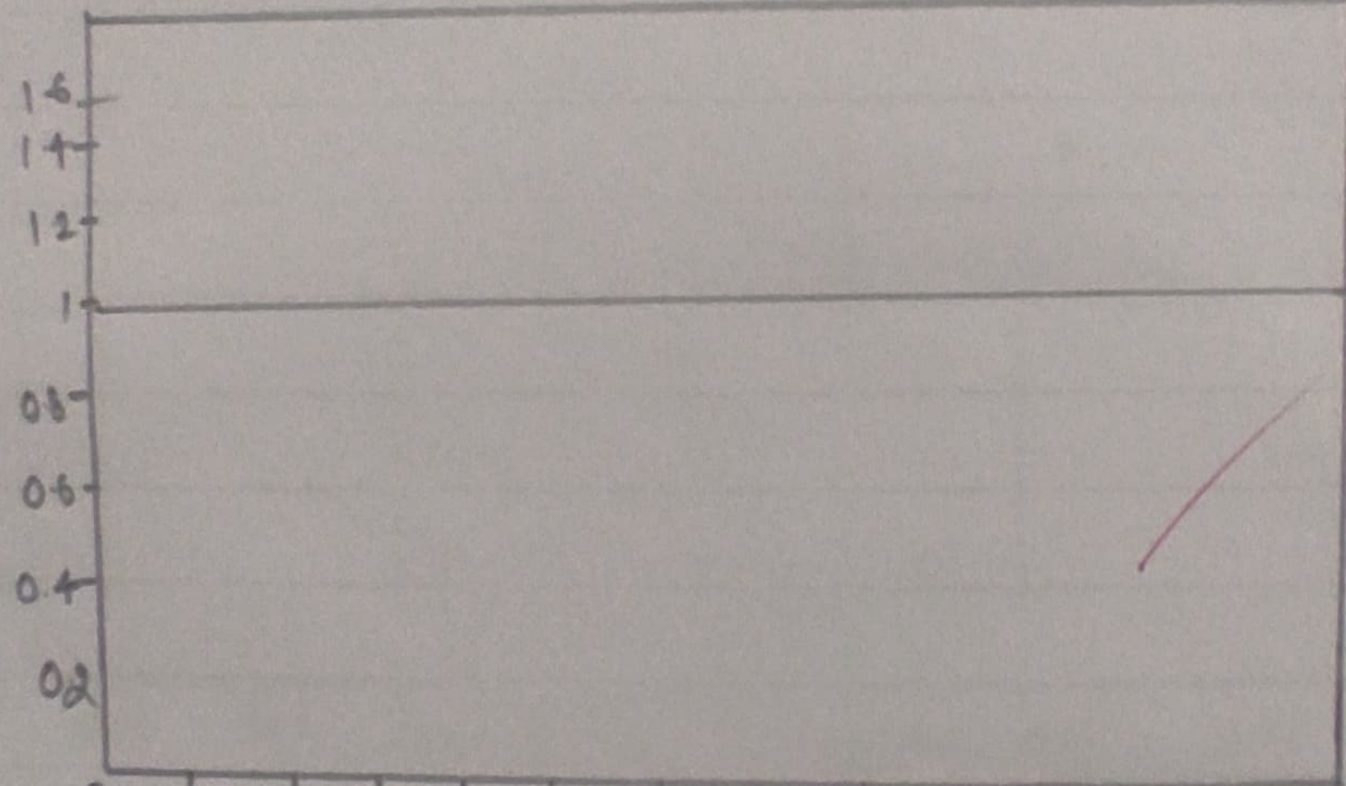
Experiment - 1(g)

AIM: Plot ramp signal which respect to differentiation.

```
x = 10 : 1 : 10;
y = x;
subplot (x, y);
dy = diff(y);
dx = diff(x);
p = dy/dx;
subplot (1,2,2);
plot(p);
```

Teacher's Signature :


10
8
6
2
0
-2
-6
-8
-10
-10
-8
-6
-2
0
2
4
6
8


16
14
12
1
08
06
0.4
02

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Expt. No. 1(h)

Page No.

Experiment - 1(h)

AIM: plot a 3 dimensional graph.

```
x = -10 : 1 : 10;
y = -5 : 0.5 : 0.5;
for i = 1 : 21
  for j = 1 : 21
  z(i;j) = emp(-x(i)^2) - y(j)^2));
  end
end
surf (x, y, z);
```

using messagrid

```
x = -10 : 1 : 10;
y = -5 : 0.5 : 5;
[x, y] = messagrid (x, y);
x = emp (-x.^2 - y.^2);
surf (X, Y, Z)
```

18/03/24

AJAY

Teacher's Signature :