Output:-

-2.0000 -1.2500 -0.5000 0 0.5000 1.5000

2.5000 3.0000.

Date

Expt. No. Page No. 1

Q.1 $y = mx + c$

Compute the y-coordinate of a line which with slop m(0.5) and c=-2 at the following x-coordinate.

x= 0, 1.5, 3, 4, 5, 7, 9, 10.

Program -

```
clear all
close all
m = 0.5 ; c = -2;
x = [0, 1.5, 3, 4, 5, 7, 9, 10]
y = m * x + c;
disp (y);
```

Teacher's Signature :

Output:-

0.5415 1.8186 0.4234 -3.0272 -4.7946.
-1.6765 4.5989 7.9149 3.7091 -5.4402

1.0000 2.5000 3.6667 4.7500 5.8000 6.8333
7.8571 8.8750 9.8889 10.9000

0.8415 -0.1892 0.0458 -0.0180 -0.0053
-0.0275 -0.0195 0.0144 -0.0078 -0.0051

Date .....

Expt. No. ..... Page No. 2

9.2 Create a vector t with 10 elements then Compute the following.

$t = 1, 2, 3 \cdots 10$

$x = t \sin(t)$

$y = \frac{t-1}{t+1}$

$z = \frac{\sin(t^2)}{t^2}$

Program:-

```
t = 1:10;
x = t.* sin(t);
y = t-1./t+1;
z = sin(t.^2)./t.^2;
disp(x);
disp(y);
disp(z);
```

Teacher's Signature :

Output:-

2.0000
1.4142
0.0000
-1.4142
-2.0000
-1.4142

0
1.4142
2.0000
1.4142
0.0000
-1.4142

Date .....

Expt. No. .....

Page No. 3

Q.3 $x = r\cos\theta$

$y = r\sin\theta$

$r = 2$

Create a column vector for θ, with values,

θ, $\pi/4$, $\pi/2$, $3\pi/4$, π and $5\pi/4$.

Compute the column vector x and y.

$x = [\ ]$, $x' = \begin{bmatrix} \\ \end{bmatrix}$

Program-

```
r = 2
t = [0, Pi/4, Pi/2, 3*Pi/4 ; Pi ; 5*Pi/4];
x = r * cos(t);
y = r * sin(t);
disp(x);
disp(y);
```

Teacher's Signature : .....

Output:-

0 1 2 3 4 5 6 7 8 9 10 11

1.0000 0.5000 0.2500 0.1250 0.0625 0.0313.

0.0156 0.0079 0.0039 0.0020 0.0010.

1.9990

2.0000

2.

Date .....

Expt. No. ..... Page No. 4

Q4 Create a vector n of 11 element from 0 to 10.

$r = 0.5$

Creak another vector.

$x = [r^0, r^1, r^2 \ldots r^n]$

find out the sum of the vector x, Repeat the procedure taking n from 0 to 50 and 0 to 100.

program-

```
n1 = 0:10;
r = 0.5;
x1 = r.^n1
disp(n1);
disp(x1);
s1 = sum(x1);
disp(s1);

%. Zero to fifty.

n2 = 0:50
x2 = r.^n2;
s2 = sum(x2);

disp(s2);
```

Teacher's Signature : _____

Date .....

Expt. No. .....

Page No. 5

```
%. Zero to hundred

n3 = 0:100;

x3 = 2.^n3;

s3 = Sum(x3);

disp(s3);
```

Teacher's Signature : _____

Output

```
    1    61
    2    62

    0    1.0000
0.1987   0.9801
0.3894   0.9211
0.5646   0.8253
0.7174   0.6967
0.8415   0.5403
0.9320   0.3624
0.9854   0.1700
0.9996  -0.0292
0.9738  -0.2272.
```

Date .....

Expt. No. ..... Page No. 6

Qs Create a vector and a matrix by using the following commands-

```
v = 0 : 0.2 : 12;
m = [sin(v); cos(v)];
```

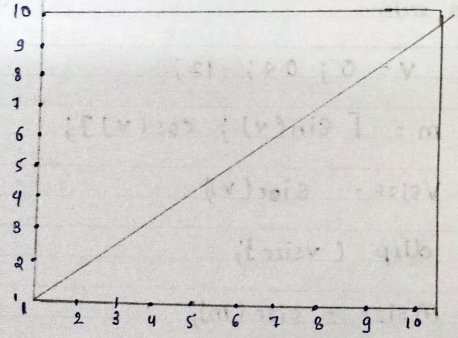
Find the size of v and m. Extract the first 10 elements of each row of matrix and display them as column vector.

Program

```
v = 0 ; 0.2 ; 12;
m = [ sin(v) ; cos(v) ];
vsize = size(v);
disp (vsize);
msize = size(m);
disp (msize);
disp (m(:, 1:10)')
```

Teacher's Signature : .....

Output :-



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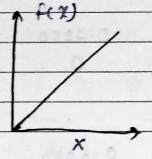
Expt. No. .....

Page No. 7

Q.6. Linear, $f(x) = x$, $\forall x$



% linear function

x = 1 : 1 : 10;

y = x;

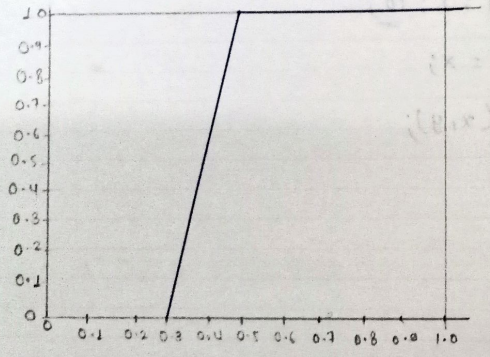
plot (x, y);

Teacher's Signature : .....

Output.

0	0.1000	0.2000	0.3000	0.4000	0.5000
0	0	0	0	1	1.

0.6000	0.7000	0.8000	0.9000	1.0000
1	1	1	1	1.

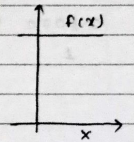


Date

Expt. No. Page No. 8

Q.7 Binary step function

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{if } x < 0. \end{cases}$$



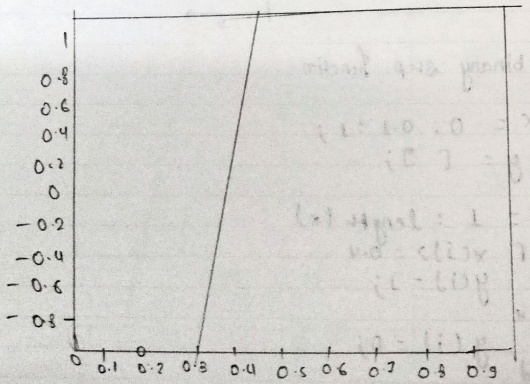

```
% binary step function.
x = 0 : 0.1 : 1;
y = [ ];
for i = 1 : length (x)
    if x(i) >= 0.4
        y(i) = 1;
    else
        y(i) = 0;
    end
end
disp (x)
disp (y)
plot (x,y)
```

Teacher's Signature :

Output -

0	0.1000	0.2000	0.3000	0.4000	0.5000
-1	-1	-1	-1	1	1

0.6000	0.7000	0.8000	0.9000	1.0000
1	1	1	1	1

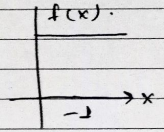


Date

Expt. No. Page No. 9

Q.8 Bipolar Step function.

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$$



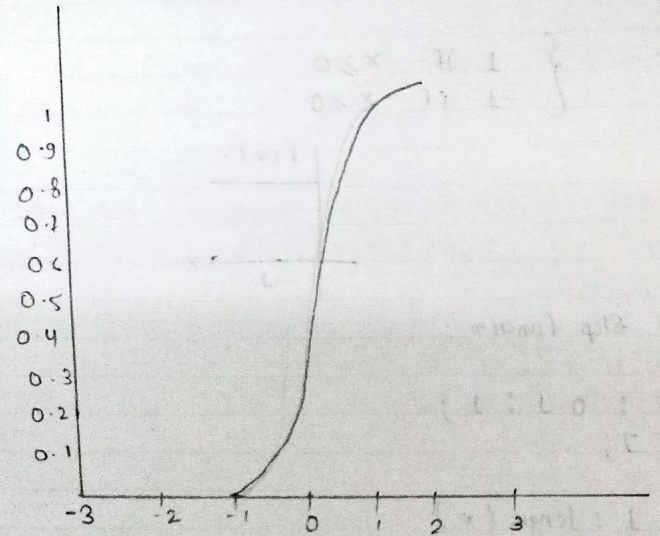

```
%. bipolar step function.

x = 0 : 0.1 : 1;
y = [];

for i = 1 : length(x)
    if x(i) > - 0.4
        y(i) = 1;
    else
        y(i) = -1
    end
end

disp(x)
disp(y)
plot(x,y)
```

Teacher's Signature :



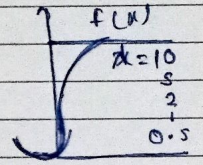
Date

Expt. No. Page No. 10

Q.9 Binary sig modal function.

$$f(x) = \frac{1}{1+e^{-\lambda x}}$$

$x = 0.1$



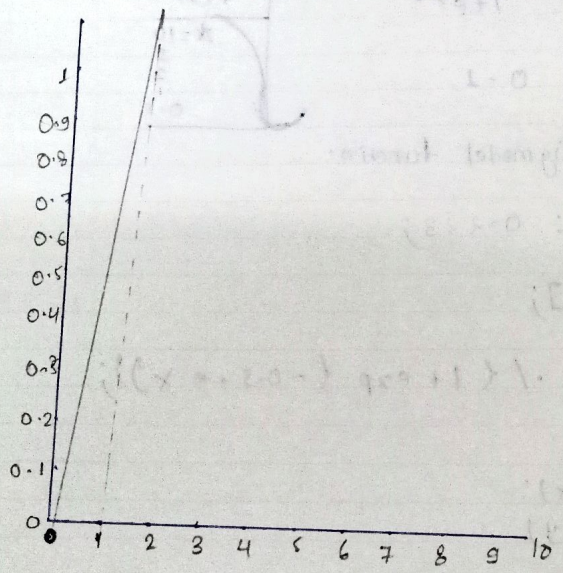
Solution v. binary Sigmodel function.

```
x = -3: 0.2 :3;
y = [];
y = 1 ./ (1 + exp (-0.5 .* x));

disp(x):
disp (y)

Plot (x, y)
```

Teacher's Signature :



Ramp function.

Date .....

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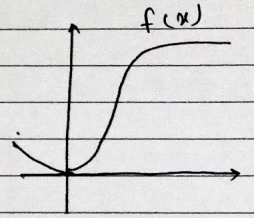
Page No. 11

Q10 Bipolar Sigmodel.

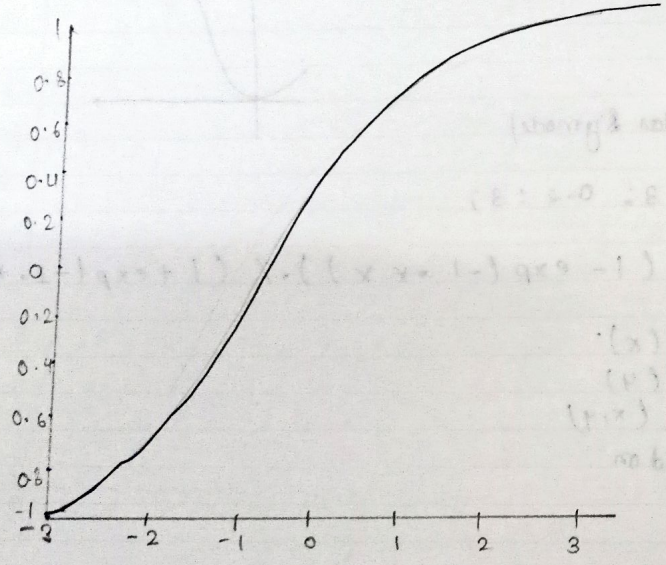
$$f(x) = \frac{1 - e^{-\lambda x}}{1 + e^{-\lambda x}}$$



% Bipolar Sigmodel

```
x = -3 : 0.2 : 3;
y = (1 - exp(-1 .* x)) ./ (1 + exp(-1 .* x));
disp(x)
disp(y)
plot(x,y)
hold on
```

Teacher's Signature : .....



Bipolar Sigmodel

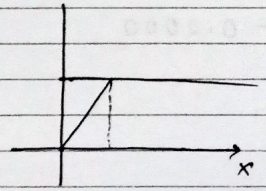
Date .....

Expt. No. .....

Page No. 12

Q.4 Ramp function

$$f(x) = \begin{cases} 1 & \text{if } x > 1 \\ x & \text{if } 0 < x \leq 1 \\ 0 & \text{if } x < 0 \end{cases}$$




```
% ramp function.
x = 0 : 0.2 : 10;
y = [];
for i = 1 : length(x)
    if x(i) > 1
        y(i) = 1;
    else
        if (x(i) >= 0 && x(i) <= 1)
            y(i) = x(i);
        else
            y(i) = 0;
        end
    end
end
disp(x)
disp(y)
plot(x,y)
```

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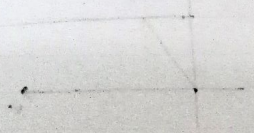
Teacher's Signature : _____

Output :-

```
     0     1     1     1

0.5000    0.5000

-0.2000
```



Date

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prog-12

(i) Implementation of OR function using perceptron algorithm

```
x = [0,0; 0,1; 1,0; 1,1];
y = [0,1,1,1,1];
W = [0.5,0.5] ; B = 0.8 ; eta = 0.5;
y_e = [];
  y = [0,0,0,0];

for i = 1:5
for j = 1:4
    v(i,j) = x(j,:)*W'+B;
if (y>=0)
        v(1,j) = 1;
  else
      v(1,j) = 0;
   end
   e(i,j) = v(1,j) - v(1,j);
   W = W + eta * e(i,j) * x(j,:);
   B = B + eta * e(i,j);
end
  end
disp(v)
disp(W)
disp(B)
```

Teacher's Signature : _____

Output.

0 0 0 1

2 1

-3

Date

Expt. No. Page No. 14

(ii) Implementation of AND function using perceptron algo.

```
x = [0,0; 0,1; 1,0; 1,1];
y = [0, 0, 0, 1];
W = [1,1]; B=0; eta=1;
y_e = [];
y = [0,0,0,0];

for i = 1:5
for j = 1:4
    v(1,j) = x(j,:)*W' + B;
    if (v>=0)
        v(1,j) = 1;
    else
        v(i,j)=0
    end
    e = y(1,j) - v(1,j);
    W = W + eta * e * x(j,:);
    B = B + B + e
        B = B + eta * e;
end
    end
disp(v)
disp(W)
disp(B)
```

Teacher's Signature :

Output:-

1 1 1 0

-2 -1

2

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Expt. No. ..... Page No. 15

(iii) Implementation of NAND function.

```
x = [0,0; 0,1; 1,0; 1,1];
v = [1,1,1,0];
W = [1,1]; B = 0; eta = 1;
V_e = [];
V = [0,0,0,0];
for i = 1:8
 for j = 1:4

    V(1,j) = x(j,:) * W' + B;
 if (V>=0)
        V(1,j) = 1;
 else
     V(1,j) = 0
 end
 e = V(1,j) - V(1,j);
 W = W + eta * e * x(j,:);
 B = B + eta * e;
end
 end
disp(V)
disp(W)
disp(B)
```

Teacher's Signature : _____

Output

```
    1     0     0     0
    0
   -0.5000   -0.5000

    0.3000
```

Date .....

Expt. No. .....

Page No. 16

(iv) NOR function using perceptron algo.

```
x = [0,0; 0,1; 1,0; 1,1];
y = [1,0,0,0];
W = [0.5, 0.5]; B = 0.8; eta = 0.5;
y_e = [];
y = [0,0,0];

for i = 1:5
 for j = 1:4

    y[1,j) = x(j,:) * W' + B;
   if (y>=0)
       y(1,j) = 1;
    else
       y(1,j) = 0;
   end
    e(i,j) = y(1,j) - y(1,j)
   W = W + eta * e(i,j) * x(j,:);
    B = B + eta * e(i,j);
 end
    end
disp(y)
disp(W)
disp(B)
```

Teacher's Signature : _____

Output:-

1 0

-0.5000

0.3000

Date .....

Expt. No. ..... Page No. 17

(v) Not function using perceptron algo-

```
x = [0;1];
y = [1,0];
W = [0.5]; B = 0.8; eta = 0.5;

y-e = [];
v = [0,0];

for j = 1:4
for i = 1:2

    v(1,j) = x(j,:)*W+B;
    if (v>=0)
        v(1,j) = 1;
    else
        v(1,j) = 0;
    end
e(i,j) = y(1,j) - v(1,j);

    W = W+eta*e(i,j)*x(j,:);
    B = B+eta*e(i,j)
end
    end
disp(v)
disp(W)
disp(B)
```

Teacher's Signature : .....

Output:-

min-max

X = 200 300 400 600 1000

0 0.1250 0.2500 0.5000 1.0000

Output:-

X = 200 300 400 600 1000

-1.0607 -0.7071 -0.3536 0.3536 1.7678

282.8427

Date

Expt. No. Program-13 Page No. 18

Normalize the following data by min-max and by Z-Score.

(i) Min-max

```
x = [200 300 400 600 1000]

clear min
M_in = min(x);
M_ax = max(x);
V = (x - M_in) * (1-0)/(M_ax - M_in);

disp(V);
```

(ii) Z-Score

```
x = [200 300 400 600 1000]

Mean_x = mean(x);

Standar_x = sqrt(sum((x - mean x) .* (x - mean x))
                 /5);

V = (x - mean_x)/standar_x;

disp(V);
disp(standar_x);
```

Teacher's Signature :

Output :-

CalFabonacci (5)

ans. 0 1 1 2 3 5

Output :-

CalFact(5)

ans = 120

Date .....

Expt. No. .....

Program-14.

Page No. 19

Fabonacci Series.

```
function [Fabonacii series] = CalFabonaci(n)

  a = 0; b = 1;
  c = [];
  c = a;
  b = b;
 Fabonacii_Series = [0,1];

for  i = 3: (n+1)
      c = a+b;
    Fabonacii_Series(i) = c;

     a = b;
     b = c;
end
```

Program-15

Factorial number.

```
Function [Factorial] = CalFact(n)

      Factorial = 1;
  for  i = 1: n
       factorial = factorial * i;
  end
```

Teacher's Signature : _____

Date .....

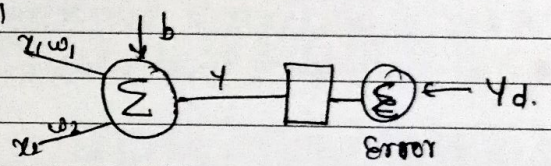
Expt. No. .....

Page No. 20

Program-16

Implement OR gate using gradient desent algorithm.

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	1



$$h = x_1 w_1 + x_2 w_2 + b$$

$$y = \frac{1}{1 + e^{-h}} \qquad e = y_d - y;$$

$$w_1 = w_1 + \eta * (y_d - y) * x_1$$
$$w_2 = w_2 + \eta * (y_d - y) * x_2$$
$$b = b + \eta * (y_d - y)$$

```
x1 = [0.1, 0.1, 0.9, 0.9];
x2 = [0.1, 0.9, 0.1, 0.9];
yd = [0.1, 0.9, 0.9, 0.9];

w = rand(1,2);
b = rand(1,1);
eta = 0.5;
```

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. 21

```
for i = 1:1000
    for j = 1:4

h = x1(j) * w(1) + x2(j) * w(2) + b;
y(j) = 1 / (1+exp(-h));

w(1) = w(1) + eta * (yd(j) - y(j)) * x1(j);
w(2) = w(2) + eta * (yd(j) - y(j)) * x2(j);

b = b + eta * (yd(j) - y(j));
E(j) = 0.5 * (yd(j) - y(j)).^2

end
    e(i) = sum(E)/4;

    if e < 0.0001
        break;
    end
end
    figure;
    semilogy(e)

x1 = .1; x2 = .1;
h = x1 * w(1) + x2 * w(2) + b;

    y1 = 1 / (1+exp(-h));
disp(round(y1));
```

Teacher's Signature : _____

Output

ans:- (x+y; x+y, x+y)

ans
x^3 +3* x ^2 *y+3*x *y^2+
y ^3;

output : >> eqn(3)
-70

ans = @(x) x^4-8*x^3+17*x^2
-4*x-20

Date

Expt. No. Page No. 22

Prog- 17

Declare x and y to be symbolic variable Define a fachr.
f as f = (x+y)^3

Syms x y
f = (x+y)^3;
factor (ans)
expand (f)

Prog-18

$f(x) = x^4 - 8x^3 + 17x^2 - 4x - 20$
$g(x) = x^2 - 4x - 4$
$h(x) = x^2 - 4x - 5$

find f(x)-g(x)h(x) at x=3

function [f,g,h] = eqn(x)

f=@(x) x^4 - 8*x^3 + 17*x^2-
4*x-20;

g=@(x) x^2 -4*x-4;

h=@(x) x^2-4*x-5;

a = f(x)-g(x)*h(x);

disp(a)
end

Teacher's Signature :

Output : cos(x+y)
-sin(x+y)

Output :

cos(y) + sin(y)

Output :

x = (6*a - 5*b) / (2*a^2 + b)

y = (5*a + 3) / (2*a^2 + b)

Date .....

Expt. No. .....

Page No. 23

Program-19

Q) $z = \sin(x+y)$

what is designate of z with respect to x and double derivate.

Ans:

```
sym x y
z = sin(x+y);
diff (z,x)
diff (z,x, 2)
```

Program-20

$$z = \int_0^{\pi/2} \sin(x+y)$$

what is integral of z with respect to x

Ans:

```
Syms x y
Z = sin(x+y);
int (z,x, 0, pi/2)
```

Program-21

$ax + by - 3 = 0$

$-x + 2ay - 5 = 0$ Solve ?

Ans:

```
Syms a b
expl = 'a*x + b*y - 3';
exp2 = '-x + 2*a*y - 5';

[x y] = solve (expl, exp2)
```

Teacher's Signature : _____

Date

Expt. No. Page No. 29

Program-22

Create a 10×10 random matrix then

a) multiply all elements by 100 and then roundoff the elements.

b) Replace all elements <10 with 0 (zero)

c) Replace all elements >90 with ∞

d) extract all elements lie between 80 and 50

Ans.

```
m = rand(10,10)
m = round(100*m)
for i = 1:10
for j = 1:10
    if (m(i,j) < 10)
        m(i,j) = 0
    end
end
end
disp(m)
for p = 1:10
  for q = 1:10

    if (m(p,q) > 90)
  m(p,q) = 99999999
end
end
end
   disp(m)
for p = 1:10
      for q = 1:10
          if (m(p,q) > 80 && m(p,q) < 50)
              disp(m(p,q))
          end

      end
end
```

Teacher's Signature :

Date .....

Expt. No. ..... Program - 23 Page No. 25

Building a neural controller for obstacle avoidance.

Ans:

```
clear all;
clc;

s = [60 50 40 30 20];
Vld = [9/10 8/10 6/10 4/10 2/10];

Vrd = [9/10 8/10 5/10 2/10 1/10];

w1 = rand(1,1);
w2 = rand(1,1);
b1 = rand(1,1);
b2 = rand(1,1);

eta = 0.5
for i = 1:1000
for j = 1:5
h1(j) = s(j) * w1 + b1;
Vl(j) = 1/(1+exp(-h1(j)));
h2(j) = s(j) * w2 + b2;
Vr(j) = 1/(1+exp(-h2(j)));
E1(j) = 1/2 * ((Vld(j) - Vl(j))^2);
E2(j) = 1/2 * ((Vrd(j) - Vr(j))^2);

w1 = w1 + eta * (Vld(j) - Vl(j)) * Vl(j) * (
```

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```
b1 = b1 + eta * (vld(i) - vl(i) * vl(i) * (1 - vl(i)));
w2 = w2 + eta * (vld(i) - vr(i) * vr(i) * (1 - vr(i) * s(i)));
b2 = b2 + eta * (vr(i) - vr(i) * vr(i) * (1 - vr(i)));
end
end

disp('final value')
disp(vl)
disp(vr).
```

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Program-26

Implement K-means clustering algorithm

```
close all;
clear all;
clr;
x = [1,10; 2,5; 8,4; 5,8; 7,5; 6,4; 1,2; 4,9];

centroid = [2,10; 5,8; 1,2];
[r,c] = size(x);

cluster1 = [1]; cluster2 = [4]; cluster3 = [7];
    for it = 1:5
new_cluster1 = []; new_cluster2 = []; new_cluster3 = [];
itr1 = 1, itr = 2, itr = 3;
for i = 1:r
      for k = 1:3
d(k) = sqrt((x(i,1) - centroid(k,1))^2)
        + (x(i,2) - centroid(k,2))^2));
    end

[mind, index] = min(d);
if (index == 1)
    new_cluster1(itr1) = i;
      itr1 = itr1 + 1;
    end
      if (index == 2)
    new_cluster2(itr2) = i;
    itr2 = itr2 + 1;
end
```

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```
if (index == 3)
    new_cluster3(itr3) = i;
        itr3 = itr3 + 1;
  end
end.
  if (isequal(cluster1, new_cluster1) == 1) &&
                isequal(cluster2, new_cluster2 == 1) &&
isequal(cluster3, new_cluster3 == 1)

  break;
end
  if (isequal(cluster1, new_cluster1) == 0)
    if (length(new_cluster1) == 1)
      centroid(1,:) = centroid(1,:);
  else.
      centroid(1,:) = mean(x(new_cluster1,:));
end
end
  if (isequal(cluster2, new_cluster2) == 0)
    if (length(new_cluster2) == 1)
      centroid(2,:) = centroid(2,:);
  else.
    centroid(2,:) = mean(x(new_cluster2,:);
end
  end
  if (isequal(cluster3, new_cluster3) == 0)
    if (length(new_cluster3) == 1)
        centroid(3,:) = centroid(3,:);
  else
```

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```
        centroid(3,:) = mean(x(new_cluster3,:));
end
  end
        cluster1 = new_cluster1;
        cluster2 = new_cluster2;
        cluster3 = new_cluster3;
end
        disp('Final Result')
        disp(cluster1)
        disp(cluster2)
        disp(cluster3).
```

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Program-25

1. Image processing.

```
clear all;
img = imread ('Pic.jpg'); %. Load image.
imshow (img); %. Show image.
x = imresize (img, [250, 250]); %. resize image.
imshow (x);
x1 = imresize (image, 1/2); %. resize
imshow (x1);
iminfo ('Pic.jpg'); %. information about image.

g = rgb2gray (x); %. Convert Color to gray.
imshow(g);
figure %. hold window.
imshow(x)
figure
imshow (g)
M = rand (250,250); %. creak image
M = M*100;
M = uint8 (M)
;imshow (M);
```

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2. Image processing histogram.

```
clear all;
img = imread('Pic.jpg');
img = rgb2gray(img);
figure.
  imhist(img);
figure.
    eq = histeq(img);
    ad = imadjust(img);
figure
    imhist(ad);
figure
  imshow(img)
figure
    imshow(eq)
    imshow(ad)
```

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denoising -

```
clear all;
img = imread ('Pic.jpg');
M = rgb2gray (img);
x = imresize (M, [250, 250]);
imshow (x);
i = imnoise (x, 'speckle', 0.05);
imshow (i);
h = Ones (5, 5)
z = imfilter (i, h);
imshow (z);

h1 = fspecial ('unsharp');
z1 = imfilter (i, h1);
imshow (z1);
h2 = fspecial ('average', 3);
z2 = imfilter (i, h2);
imshow (z2);

% Medium filter.
M = Medfilt2 (i, [3,3]);
imshow (M);
% Wiener filter.
n = wiener2 (i, [3,3]);
imshow (n);
% smoothing filter
g = imgaussfilt (i);
imshow(g)
```

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Output

Y = 23.208972 + 3.537476 * x.

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WAP for linear regression.

```
clear all;
close all;
clc;
x = [3, 8, 9, 13, 3, 6, 11, 21, 1, 16];
Y = [30, 57, 64, 72, 36, 43, 59, 90, 20, 87];

Mean_x = mean(x);
Mean_y = mean(y);
Sum1 = 0;
Sum2 = 0;
for i = 1:10
Sum1 = Sum1 + (x(i) - mean_x) * (y(i) - Mean_y)
Sum2 = Sum2 + (x(i) - mean_x) ^2 );
end
w1 = Sum1 / Sum2;
w0 = mean_y - w1 * Mean_x;
Fprintf('y = %f + %f * x/n', w0, w1);
```

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	$y = mx + c$.				
Q.1	Compute the y-coordinate of a line which slop m(0.5) and c = -2 at the following x-coordinate.		1 08/08/19		
Q.2	Create a vector t with 10 elements then compute the following.		2 — 11 —		
Q.3	Create a column vector. for a with value a $\pi/4, \pi/2, 3\pi/4, \pi, 5\pi/4$ compute the column vector x and y.		3 — 11 —		
Q.4	Create a vector n element from 0 to 10 r = 0.5 create another vector 0 to 50 and 0 to 100		4-5 — 11 —		
Q.5	Create a vector and matrix by using following command		6 22/08/19		
Q.6	linear function f(x) = x, ∀x.		7 — 11 —		

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Q.12	Implementation of OR function using perceptron algorithm AND function, NAND, NOR				
Q.13	Normalize the following data by min-max and by Z-score.				
Q.14	Fabonacci serie				
Q.15	factorial number.				
Q.16	Implement OR gate using gradient desent algo.				

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S.N.	Name of Experiment	Page No	Date of Experiment	Date of Submission	Remarks
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Q.18.	$f(x) = x^4 - 8x^3 + 17x^2 - 4x + 20$ $g(x) = x^2 - 4x - 4$ $h(x) = x^2 - 4x - 5$ find $f(x) - g(x)h(x)$ at $x=3$	22			
Q.19	$z = \sin(x+y)$ what is diagnal of z with Respect to x and double derivate.	23			
Q.20.	$z = \int_0^{\pi/2} \sin(x+t)$ what is Integral of z with respect to x.	23			
Q.21	$ax + by - 3 = 0$ $-x + 2ay - 5 = 0$ solve?	23			
Q.22	Create a 10x10 random matrix then a) multiply all element by 100 and then roundoff the element.	24			

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c) Replace all elements >90 with ∞	24			
d) extract all elements lie b/w 30 and 50				
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