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Practical 1: Write a program for linear fit of the curve using MATLAB

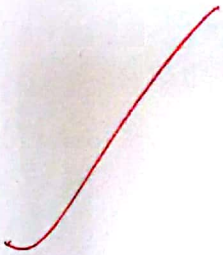
Code:

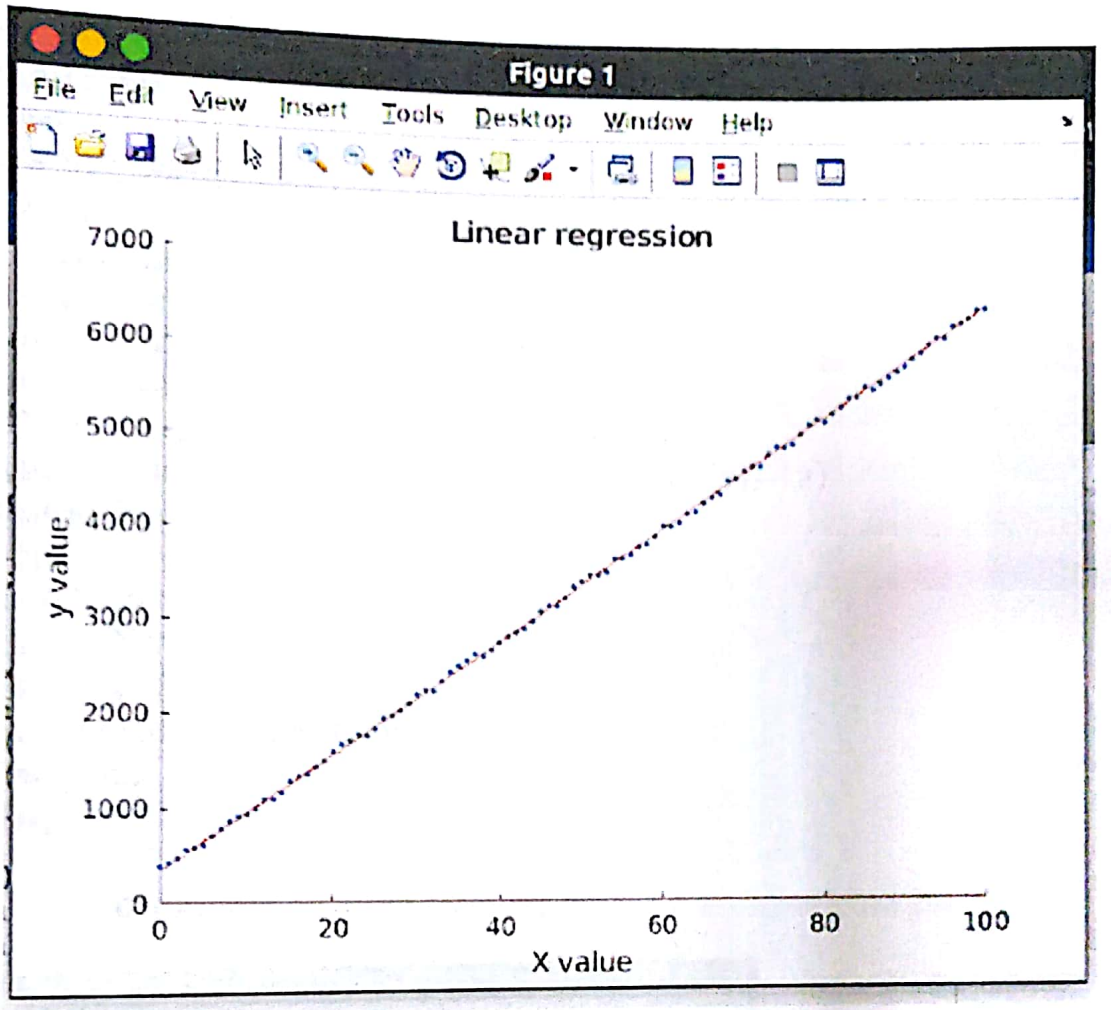
```
X = [0:1:100];
m = 100*rand;
c = 500*rand;
y = m*X+c+100*rand(size(X));
coefs = polyfit(X, y, 1);
yCalc = coefs(1)*X+coefs(2);
Rsq = 1 - sum((y - yCalc).^2)/sum((y - mean(y)).^2)
scatter(X,y,'.')
hold on
plot(X, yCalc)
xlabel('X value')
ylabel('y value')
title('Linear regression')
```

Output

```
Rsq =

    0.9997
```





Practical 2: Write a program for quadratic fit of the curve using MATLAB

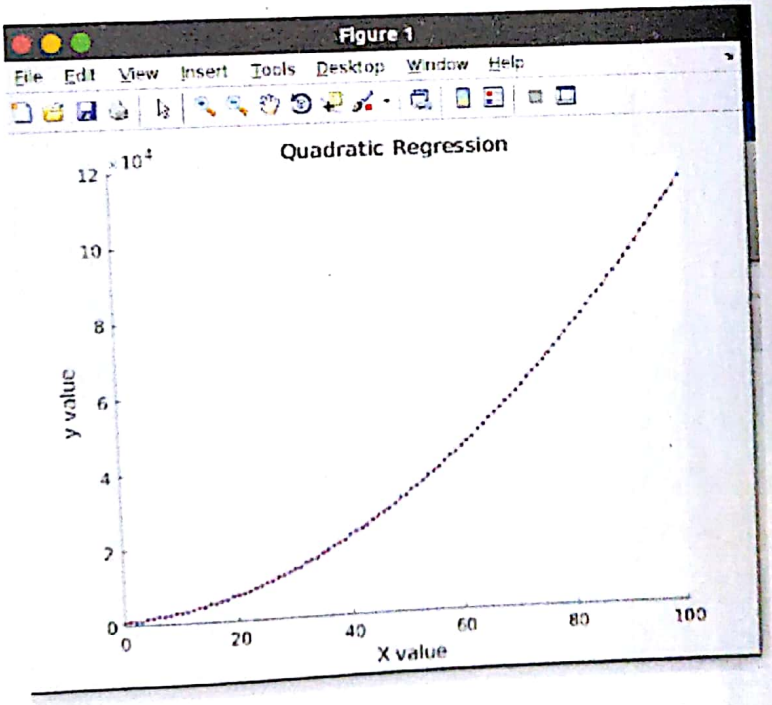
Code:

```
X = [0:1:100];
a = 100*rand;
b = 200*rand;
c = 500*rand;
y = a*X.^2+b*X+c+700*rand(size(X));
coefs = polyfit(X, y, 2);
yCalc = coefs(1)*X.^2+coefs(2)*X+coefs(3);
Rsq = 1 - sum((y - yCalc).^2)/sum((y - mean(y)).^2)
scatter(X,y,'.')
hold on
plot(X, yCalc)
xlabel('X value')
ylabel('y value')
title('Quadratic Regression')
```

Output:

```
Rsq =

    1.0000
```



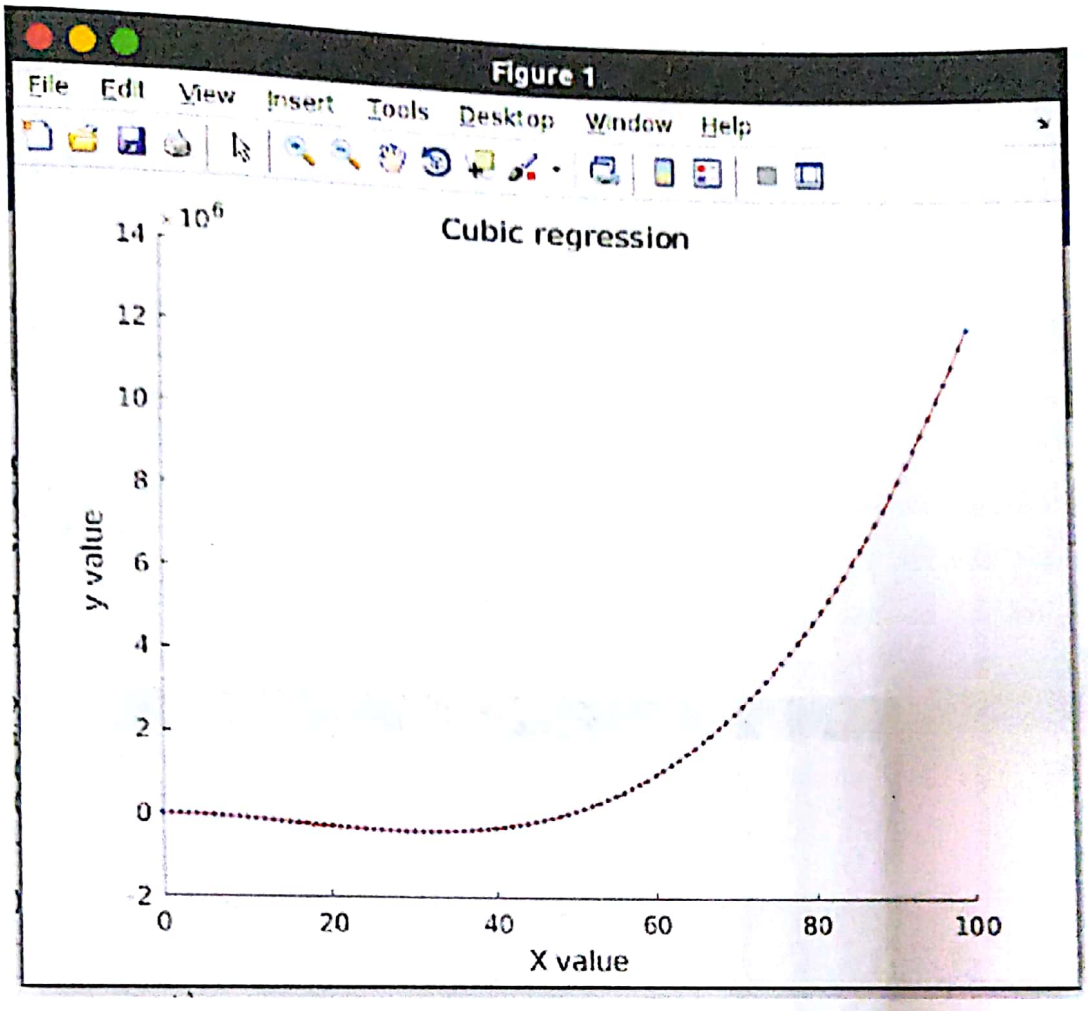
Practical 3: Write a program to find cubic fit of the curve using MATLAB

Code:

```
X = [0:1:100];
a = 100*rand;
b = 100*rand+1000;
c = 100*rand+1000;
d = 100*rand
y = a*X.^3-b*X.^2-c*X-d+700*rand(size(X));
coefs = polyfit(X, y, 3);
yCalc = coefs(1)*X.^3+coefs(2)*X.^2+coefs(3)*X+coefs(4);
Rsq = 1 - sum((y - yCalc).^2)/sum((y - mean(y)).^2)
scatter(X,y,'.')
hold on
plot(X, yCalc)
xlabel('X value')
ylabel('y value')
title('Cubic regression')
```

Output:

```
Rsq =
     1
```



Practical 4: Write a program to find cubic spline for the data and find its R2

Code:

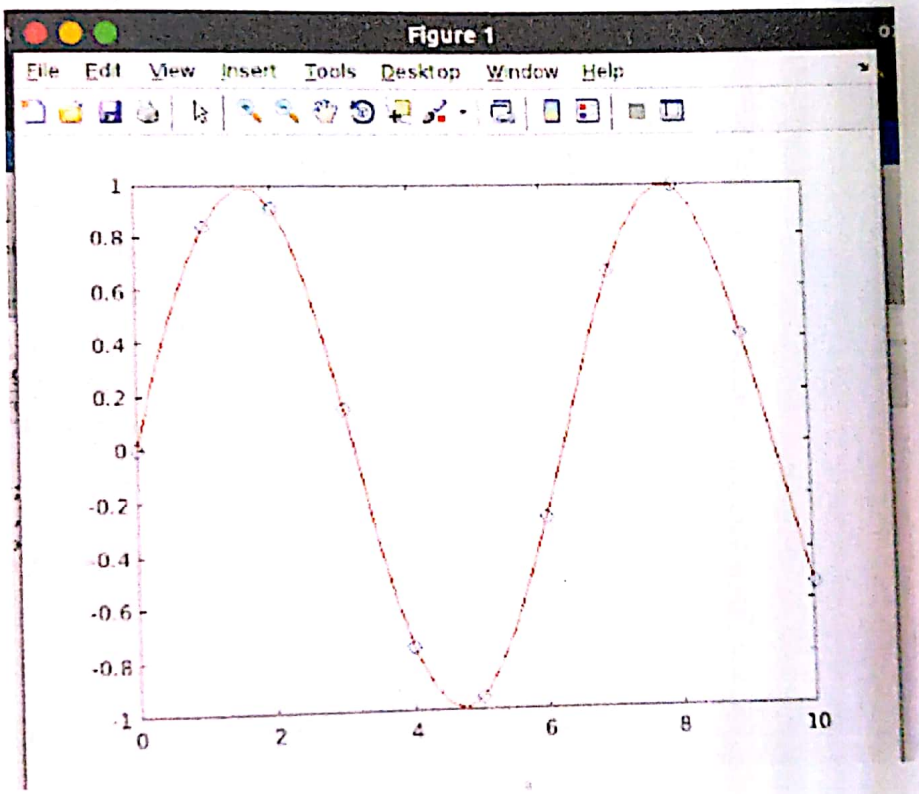
```
X = [0:1:10];
y = sin(x);

yCalc = spline(X,y,X);
Rsq = 1 - sum((y - yCalc).^2)/sum((y - mean(y)).^2)
fplot(@(x) sin(x),[0 10],'b')
hold on;
scatter(x,yCalc,'.')
```

Output:

Rsq =

1



Practical 5: Write a program for multiple regression using MATLAB

Code:

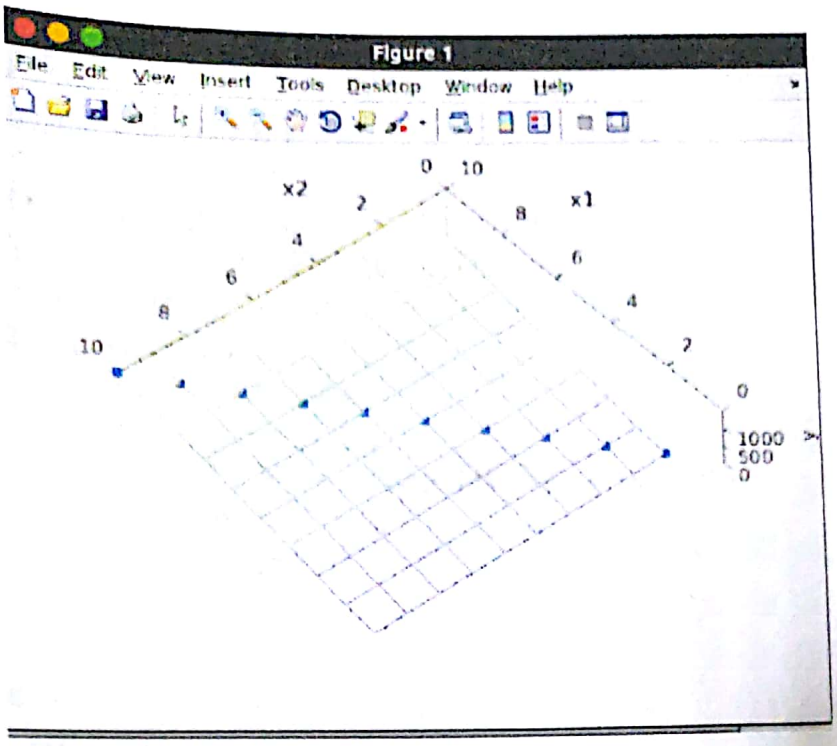
```
x1 = 1:1:10;
x2 = 1:1:10;
a = 100*rand;
b = 100*rand;
c = 100*rand;
y = a*x1+b*x2+c;

X = [ones(size(x1)); x1; x2];

size(X)
size(y)
b = regress(y', X')
scatter3(x1,x2,y,'filled')
hold on

[X1FIT,X2FIT] = meshgrid(x1,x2);
YFIT = b(1) + b(2)*X1FIT + b(3)*X2FIT;
mesh(X1FIT,X2FIT,YFIT)
xlabel('x1')
ylabel('x2')
zlabel('y')
view(50, 100)
hold off
```

Output:

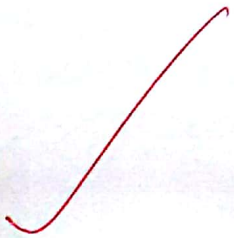


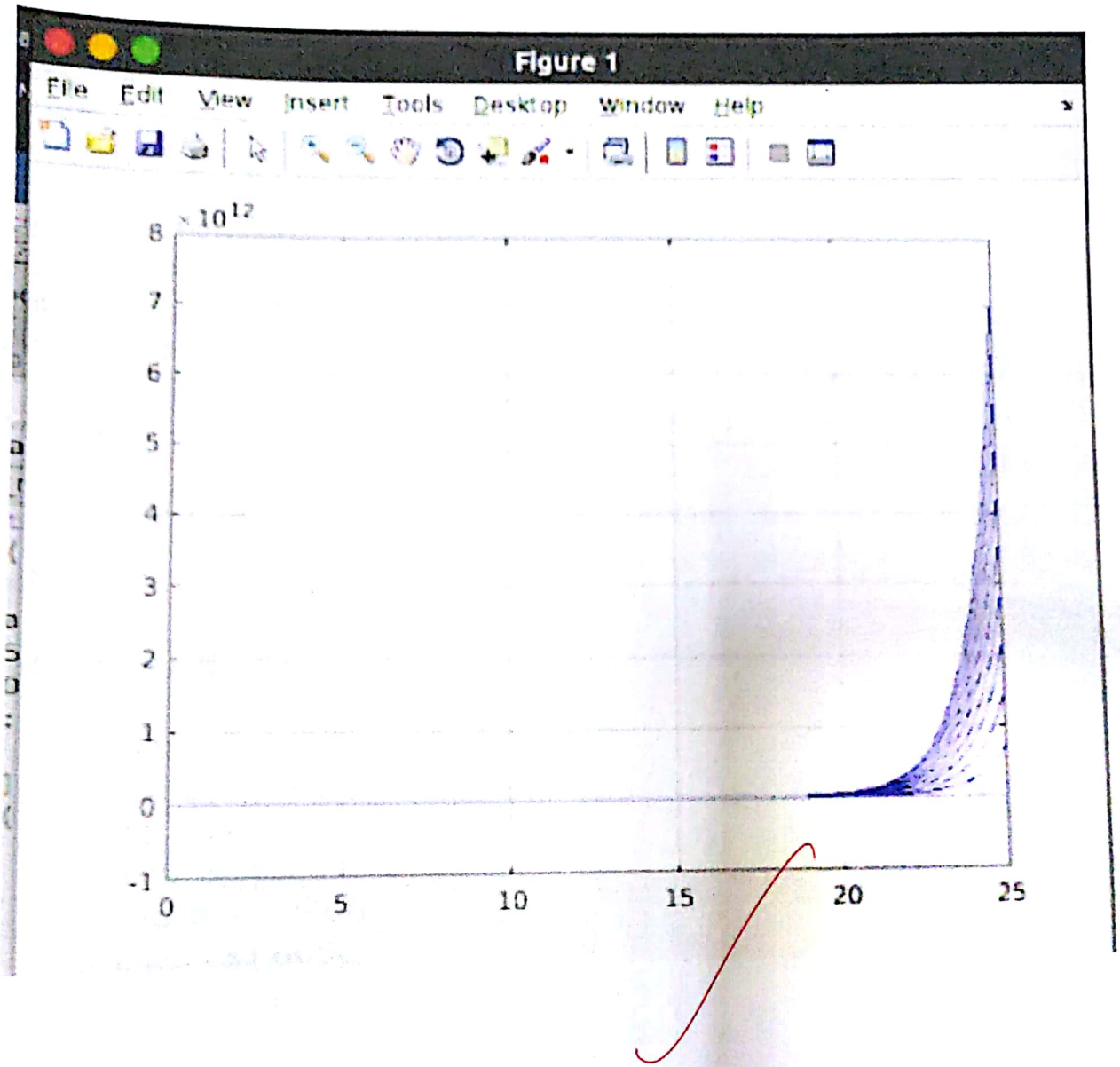
Practical 6: Draw some trajectories for predator-prey problem

Code:

```
syms x(t) y(t) T Y
eqns = [diff(x(t), t)==x(t)*(1-0.1*y(t)); diff(y(t),t)==-y*(1-0.1*x)];
[DEsys,Subs] = odeToVectorField(eqns);
DEFcn = matlabFunction(DEsys, 'Vars',{T,Y});
tspan = [0,25];
for i=0:10:100
        for j =0:10:100
                yo = [i, j];
                [T,Y] = ode45(DEFcn, tspan, yo);
                plot(T,Y,'b')
                hold on
                grid
        end
end
```

Output:





Practical 7: Write a program for statistical analysis of data using MATLAB

Code:

```
load census
[xds] = datastats(pop)
variance = var(pop)
std_dev = std(pop)
corr = corrcoef(cdate,pop)
covariance = cov(pop)
```

Output:

```
>> statistics_m

xds =

  struct with fields:

        num: 21
        max: 248.7000
        min: 3.9000
        mean: 85.7286
        median: 62.9000
        range: 244.8000
        std: 78.6011


variance =

   6.1781e+03


std_dev =

   78.6011


corr =
```

1.0000	0.9597
0.9597	1.0000

covariance =

6.1781e+03

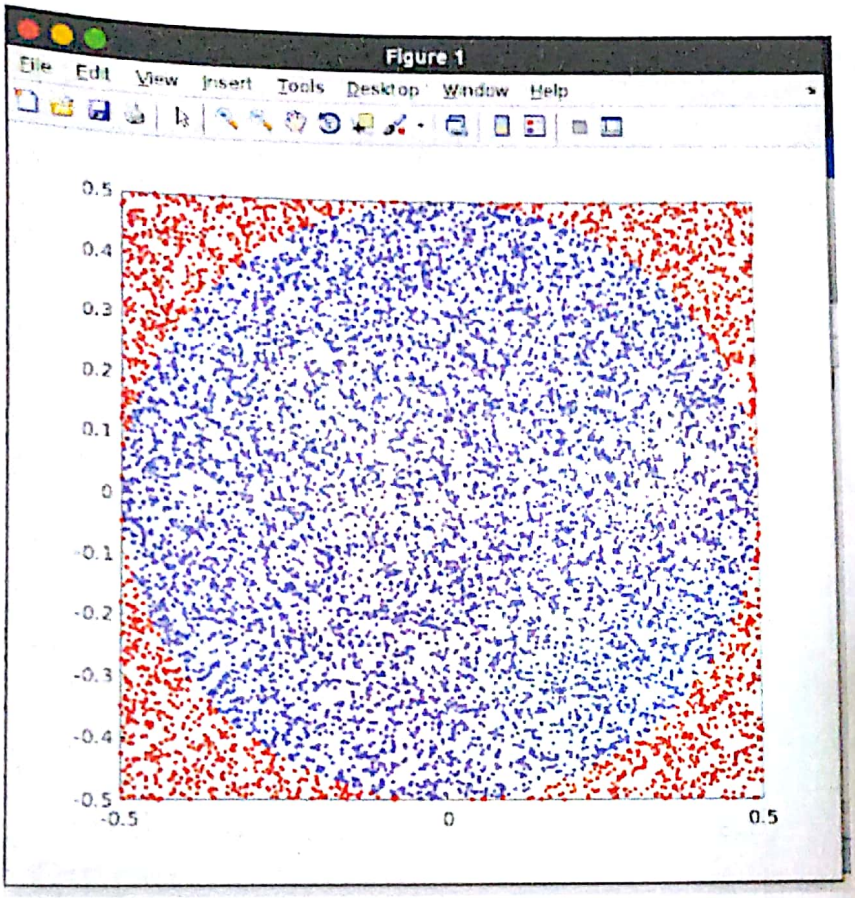
Practical 8: Write a program for Monte Carlo method

Code:

```
n = 10000;
x = rand(n, 1);
y = rand(n, 1);
x = x - 0.5;
y = y - 0.5;
r = x.^2 + y.^2;
m=0;
hold on
for i=1:n
        if r(i) <= 0.25
        m=m+1;
        plot(x(i),y(i),'b.');
        else
        plot(x(i),y(i),'r.');
        end
end
pi = m/(0.25*n)
```

Output:

```
>> monte_carlo
pi =
        3.1420
```

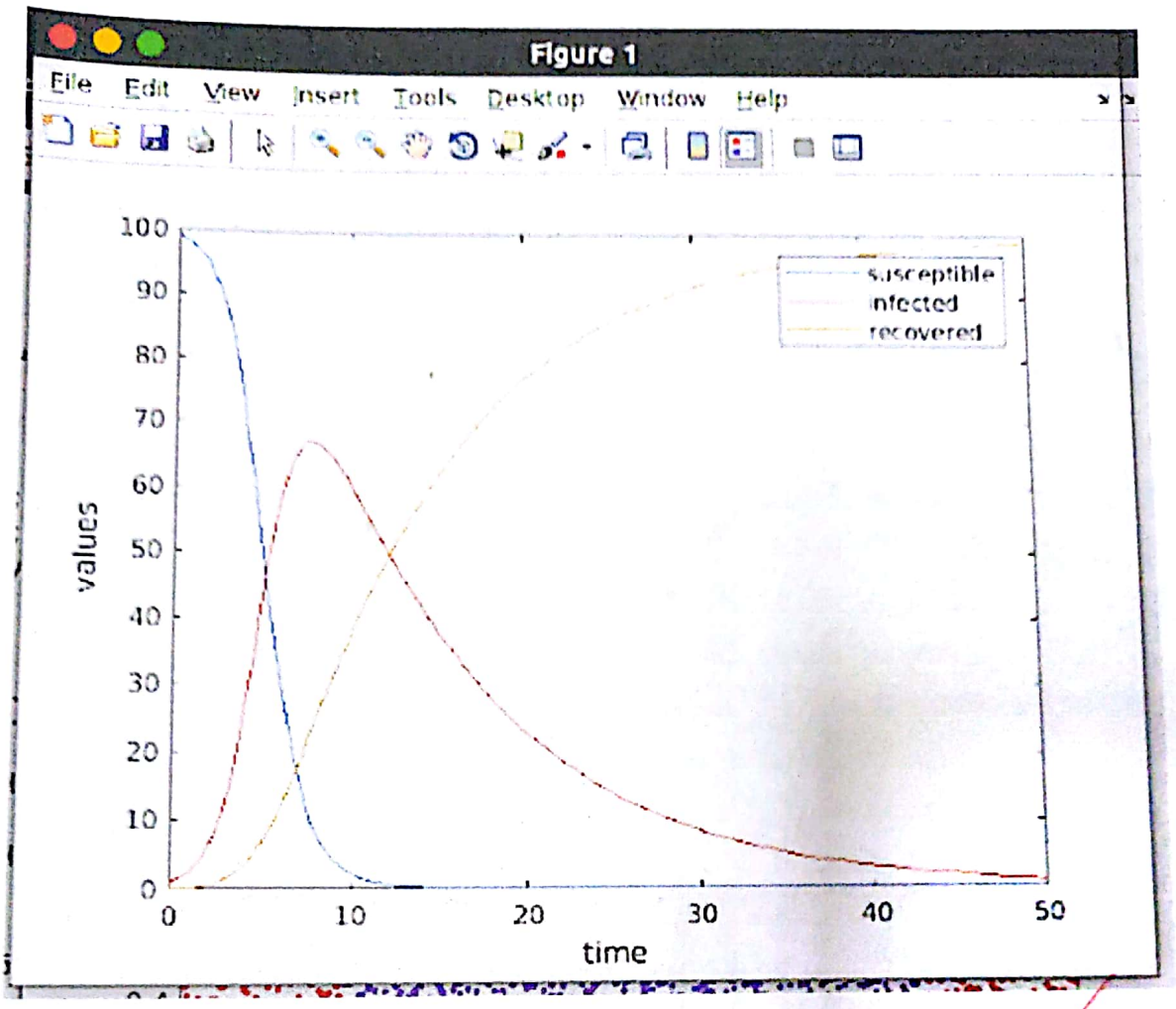


Practical 9: Write a program for epidemic model in MATLAB

Code:

```
function [dydt] = sir(t,y)
        a = 0.01;
        b = 0.1;
        dydt(1) =-a*y(1)*y(2);
        dydt(2) = a*y(1)*y(2)-b*y(2);
        dydt(3) = b*y(2);
        dydt = [dydt(1) dydt(2) dydt(3)]';
end
yo = [99 1 0];
a = 0.01;
b = 0.1;
[t,y] = ode45('Sir',[0 50],yo);
plot(t,y(:,1),t,y(:,2),t,y(:,3))
xlabel('time')
ylabel('values')
legend('susceptible','infected', 'recovered')
```

Output:



21/10/19