

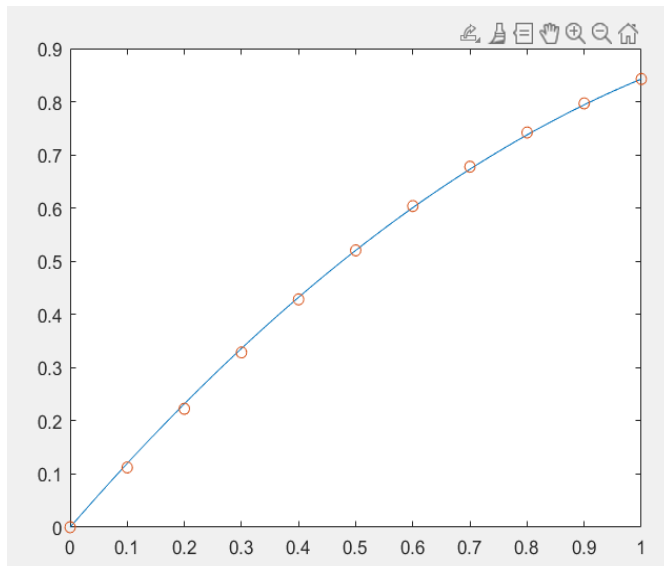
Lab Assignment MA322

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Q1.

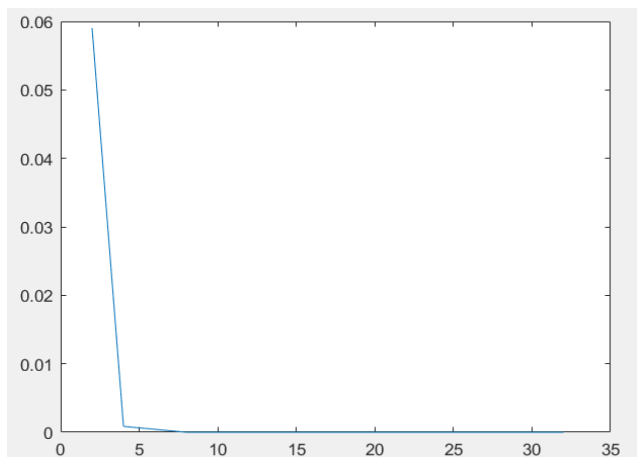


Q2.

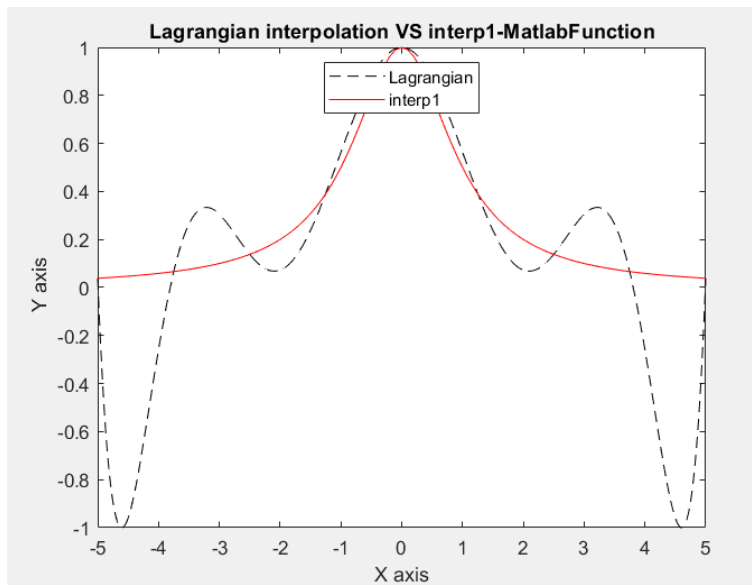
```
En = 5.902928e-02 for n = 2  
En = 8.559552e-04 for n = 4  
En = 4.822512e-08 for n = 8  
En = 1.332268e-15 for n = 16  
En = 1.711964e-11 for n = 32
```

E =

```
0.0590    0.0009    0.0000    0.0000    0.0000
```



Q3.



Q1

```
clear
L1=@(x) ((x-0.5).*(x-1))/((0-0.5)*(0-1));
L2=@(x) ((x-0).*(x-1))/((0.5-0)*(0.5-1));
L3=@(x) ((x-0).*(x-0.5))/((1-0)*(1-0.5));
p=@(x) 0*L1(x)+0.52049987781305*L2(x)+0.84270079294971*L3(x);
x=linspace(0,1);
x1=[0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1];
y1=[0 0.11246291601828 0.22270258921048 0.32862675945913 0.42839235504667
0.52049987781305 0.60385609084793 0.67780119383742 0.74210096470766
0.79690821242283 0.84270079294971];
plot(x,p(x));
hold on
scatter(x1,y1);
```

Q2.

```
clc;
clear;
n_given = [2,4,8,16,32];
E = [0,0,0,0,0];
temp = 1;
for n=[2,4,8,16,32]
    f = @(x) exp(x);
    x = linspace(-1,1,n+1);
    y = f(x);
    xp = linspace(-1,1,501);
    diff = zeros(n+1,n+1);
    diff(:,1)=y;

    for j=2:n+1
        for i=1:1:n-j+2
            diff(i,j)=diff(i+1,j-1)-diff(i,j-1);
        end
    end
end
```

```

    answer = y(1);
    h=x(2) - x(1);
    p=(xp-x(1))/h;
    for i=1:n
        term=1;
        for j=1:i
            term=term.*(p-j+1)/j;
        end
        answer = answer+term.*diff(1,i+1);
    end
    fp = answer;
    En = max(f(xp)-fp);
    fprintf('En = %u for n = %u\n',En,n);
    E(temp)=En;
    temp = temp+1;
end
E
plot(n_given, E)

```

Q3.

```

%% Lagrangian interpolation
clear;clc;close all;

```

```

for i = 1:9
    X(i) = 5*(i-5)/4;
    Y(i) = 1/(1+(X(i)*X(i)));
end

```

```

xq=-5:0.1:5;
f = @(x) 1/(1+(x^2));
y = arrayfun(f,xq);
syms x
S=0;
for i=1:length(X)
    temp=X;
    A=temp(i);
    temp(i)=[];
    L=prod((x-temp)./(A-temp),'all');
    S=(L*Y(i))+S;
    L=[];
end

```

```

figure()
fplot(S,'black--',[min(X) max(X)]);
hold on
F=interp1(X,Y,xq);
%%plot(xq,F,"bo");
hold on
plot(xq,y,"r");
legend("Lagrangian","interp1","f(x)","Location','north');
xlabel(" X axis ");
ylabel(" Y axis");
title("Lagrangian interpolation VS interp1-MatlabFunction")

```