Indian Institute of Information Technology Vadodara

MA202: Numerical Techniques Lab
Semester: IV
Lab 8

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Section : **2A**

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Note: I have made PDF from next page using matlab only. They are in parts. I have merged them all.

Question-1

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Interpolation by Newton polynomial

Done by Name - chakradhar srinivas; Id - 201951048

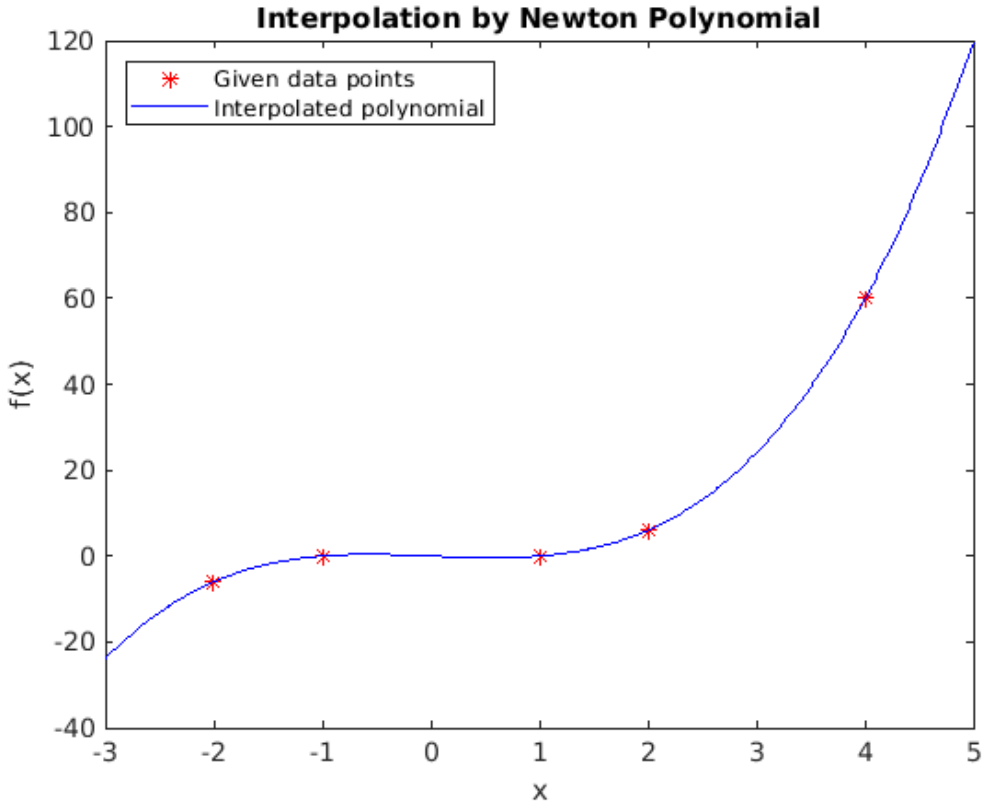
```
x = [-2 -1 1 2 4];
y = [-6 0 0 6 60];
ddTable = divdiff(x, y);
coeffs = newton(ddTable, x);
disp('The Divided Difference table caluclated is:-')
disp(ddTable)
disp('The coefficients of Newton Polynomial caluclated are:-')
disp(coeffs)
```

```
The Divided Difference table caluclated is:-
    -6     6    -2     1     0
     0     0     2     1     0
     0     6     7     0     0
     6    27     0     0     0
    60     0     0     0     0

The coefficients of Newton Polynomial caluclated are:-
     0     1     0    -1     0
```

Plotings

```
xValues = linspace(-3, 5, 500);
yValues = polyval(coeffs, xValues);
figure(1);
plot(x, y, 'r*', xValues, yValues, 'b-')
title('Interpolation by Newton Polynomial')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
% Function for Divided Difference table
function divdiffTable = divdiff(x, y)
    n = length(x) - 1;
    divdiffTable = zeros(n + 1, n + 1);
    divdiffTable(1 : n + 1, 1) = y';
    for i = 2 : n + 1
        for j = 1 : n - i + 2
```

```
            divdiffTable(j, i) = (divdiffTable(j+1, i-1) -
 divdiffTable(j, i-1))/(x(i+j - 1) - x(j));
        end
    end
end

% Function for coefficients of Newton Polynomial
function coeff = newton(ddTable, x)
    n = length(x) - 1;
    a = ddTable(1, :);
    coeff = a(n+1);
    for i = n:-1:1
        coeff = [coeff a(i)] - [0 coeff*x(i)];
    end
end
```



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Question-2

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Interpolation by Newton polynomial

Done by Name - chakradhar srinivas; Id - 201951048

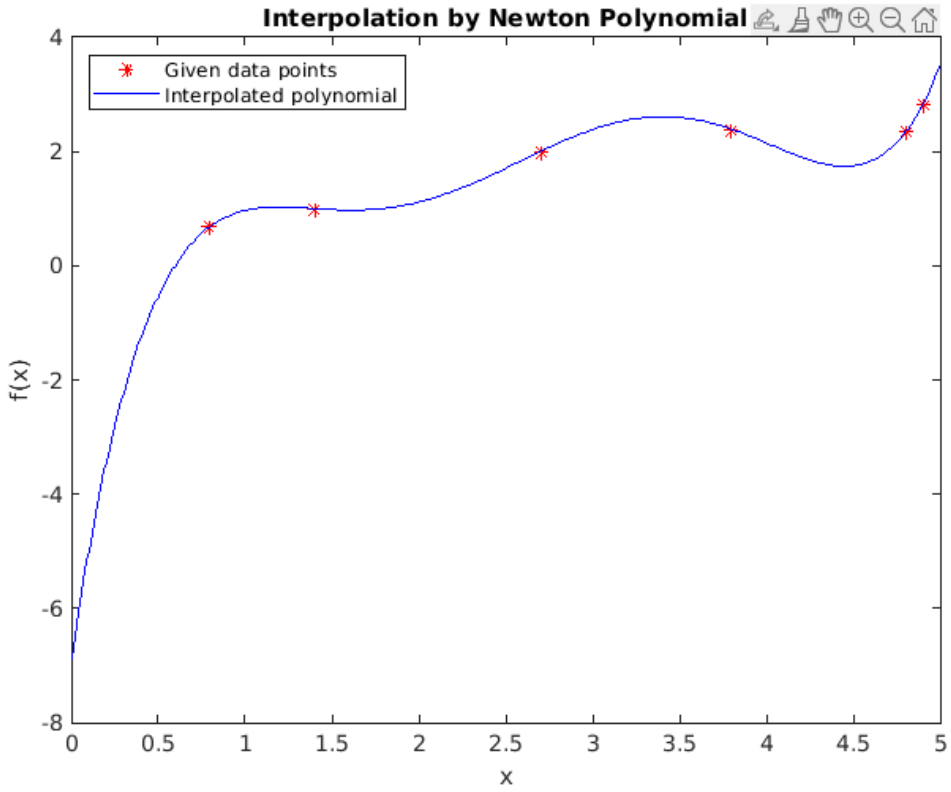
```
x = [0.8 1.4 2.7 3.8 4.8 4.9];
y = [0.69 1.00 2.00 2.39 2.34 2.83];
ddTable = divdiff(x, y);
coeffs = newton(ddTable, x);
disp('The Divided Difference table caluclated is:-')
disp(ddTable)
disp('The coefficients of Newton Polynomial caluclated are:-')
disp(coeffs)
```

```
The Divided Difference table caluclated is:-
    0.6900    0.5167    0.1329   -0.1019    0.0240    0.1432
    1.0000    0.7692   -0.1728   -0.0058    0.6111         0
    2.0000    0.3545   -0.1926    2.1330         0         0
    2.3900   -0.0500    4.5000         0         0         0
    2.3400    4.9000         0         0         0         0
    2.8300         0         0         0         0         0

The coefficients of Newton Polynomial caluclated are:-
    0.1432   -1.9091    9.3460  -20.6759   20.9512   -6.8885
```

Plotings

```
xValues = linspace(0, 5, 500);
yValues = polyval(coeffs, xValues);
figure(1);
plot(x, y, 'r*', xValues, yValues, 'b-')
title('Interpolation by Newton Polynomial')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
% Function for Divided Difference table
function divdiffTable = divdiff(x, y)
    n = length(x) - 1;
    divdiffTable = zeros(n + 1, n + 1);
    divdiffTable(1 : n + 1, 1) = y';
    for i = 2 : n + 1
```

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

% Function for coefficients of Newton Polynomial
function coeff = newton(ddTable, x)
    n = length(x) - 1;
    a = ddTable(1, :);
    coeff = a(n+1);
    for i = n:-1:1
        coeff = [coeff a(i)] - [0 coeff*x(i)];
    end
end
```



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Question-3

Table of Contents

Interpolate of Question 1

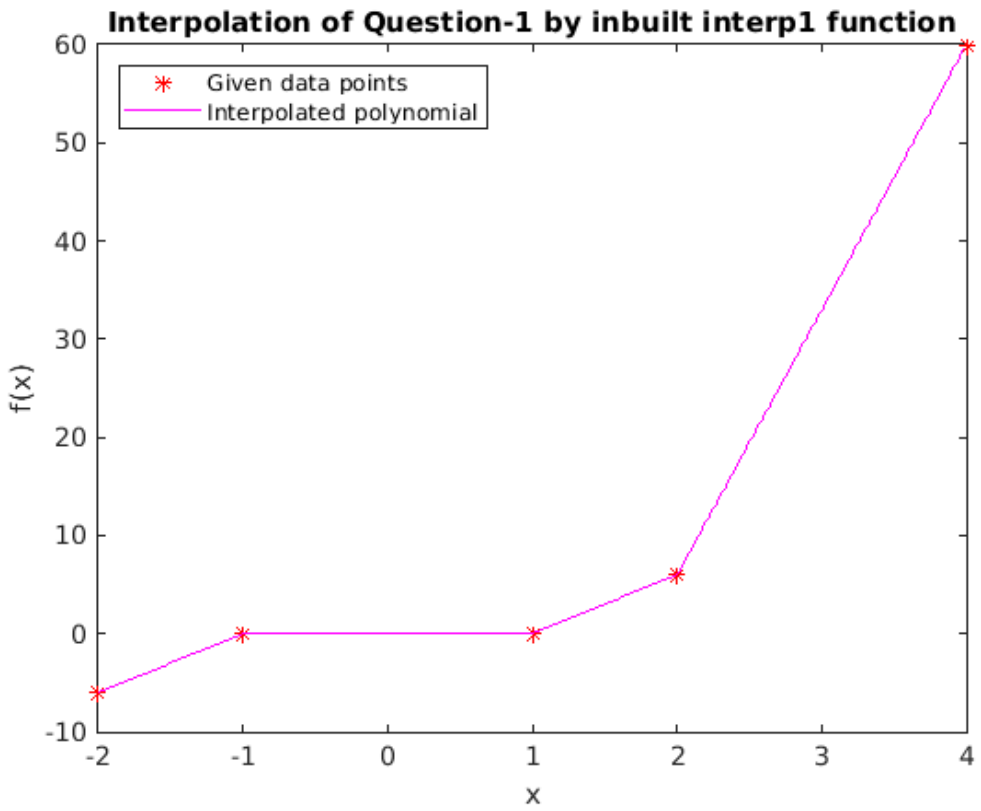
Done by Name - chakradhar srinivas; Id - 201951048

```
x = [-2 -1 1 2 4];
y = [-6 0 0 6 60];
```

Plotings

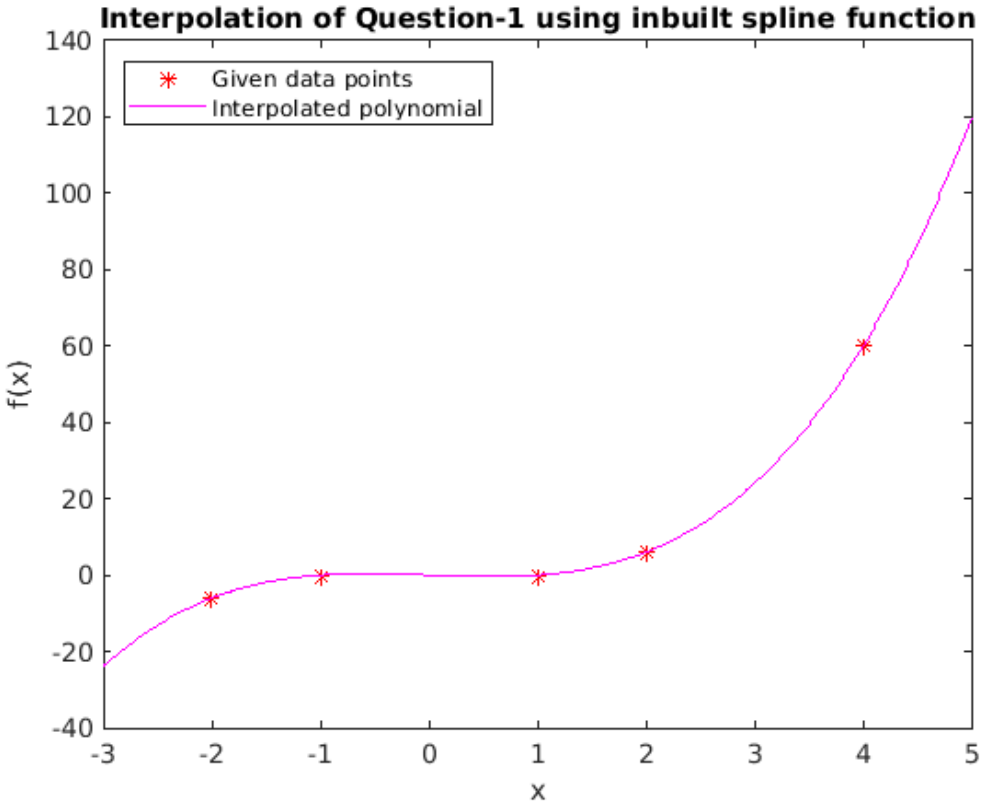
Using interp1 function

```
figure(1);
xValues = linspace(-3, 5, 500);
yValues = interp1(x,y,xValues);
plot(x, y, 'r*', xValues, yValues, 'm-')
title('Interpolation of Question-1 by inbuilt interp1 function')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
```



Using spline function

```
figure(2);
xValues = linspace(-3, 5, 500);
yValues = spline(x, y, xValues);
plot(x, y, 'r*', xValues, yValues, 'm-');
title('Interpolation of Question-1 using inbuilt spline function')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
```



Interpolate of Question 2

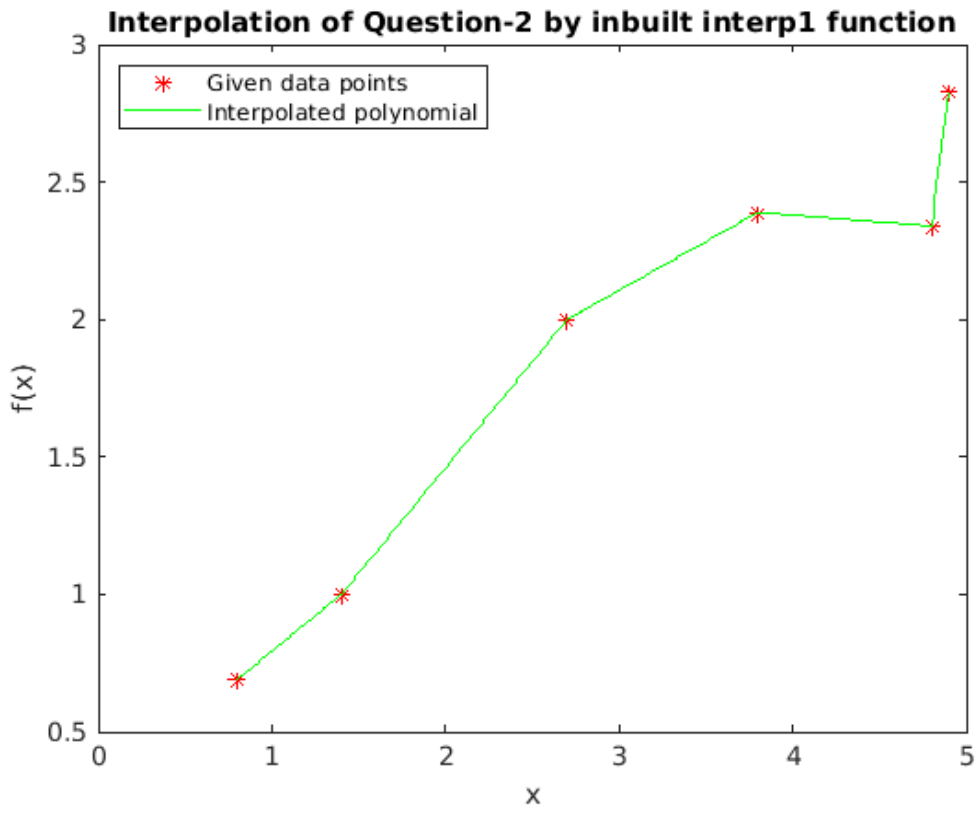
Done by Name - chakradhar srinivas; Id - 201951048

```
x2 = [0.8 1.4 2.7 3.8 4.8 4.9];
y2 = [0.69 1.00 2.00 2.39 2.34 2.83];
```

Plotings

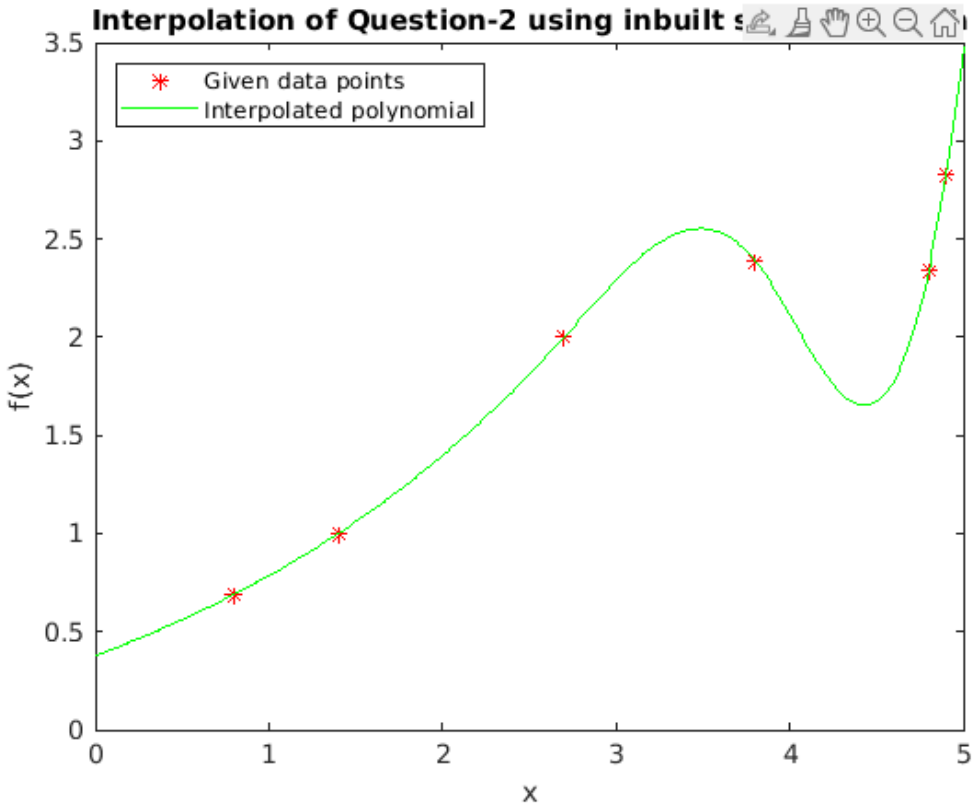
Using interp1 function

```
figure(3);
xValues = linspace(0, 5, 500);
yValues = interp1(x2,y2,xValues);
plot(x2, y2, 'r*', xValues, yValues, 'g-')
title('Interpolation of Question-2 by inbuilt interp1 function')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
```



Using spline function

```
figure(4);
xValues = linspace(0, 5, 500);
yValues = spline(x2, y2, xValues);
plot(x2, y2, 'r*', xValues, yValues, 'g-');
title('Interpolation of Question-2 using inbuilt spline function')
legend('Given data points', 'Interpolated
 polynomial', 'Location', 'northwest')
xlabel('x')
ylabel('f(x)')
```



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