# Department of Computing

# MATH 333: Numerical Analysis

# Class: BSCS-10ABC

# Lab 8: Polynomial, Interpolation, Curve fitting (Part 1)

# Date: April 18, 2024

# Time: 10:00 pm-1:00 pm & 2:30pm -5:00pm

# Lab Engineer: Anum Asif

# Lab 8: Polynomial,Interpolation

**Introduction**

Matlab represents polynomials with a vector of coefficients. The length of the vector will always be one more than the order of the polynomial

y = x2 + 5x -3 is represented as [1 5 -3]

y = -x3/3 + x is represented as [-1/3 0 1 0]

**Objectives**

The purpose of this lab is to get familiar with Interpolation.

**Tools/Software Requirement**

Matlab R2016a

**Description**

**Interpolation**

Given a set of data points, you can use use **interp1.m** to interpolate between them at one or more x values. The method defaults to a linear interpolation.

x = [0 2 4];

y = [0 2 8];

plot(x,y,'sk-')

hold on

x2 = [1 3]

y2linear = interp1(x,y,x2)

plot(x2,y2linear,'go')

legend('Data','Linear')

**Curve Fitting with polynomials**

If you have a set of data points that you want to find a 'best fit line' for, use the **polyfit** command. This will perform a 'least squares' fit which minimizes the error (distances) between the data and the fitted curve. The experimental data will not necessarily lie on the fitted curve. The **polyval** command is used to evaluate a polynomial for a given set of x values. This is useful in interpolation and plotting.

**Find the equation of the line that best fits a set of data**

data=[0 .3

1 .9

2 2.2

3 3.1

4 4.0

5 5.4];

x=data(:,1);

y=data(:,2);

% get polynomial coefficients (pc) of bets fit line

pc = polyfit(x,y,1); % 1 means linear fit

plot(x,y,'ro');

hold on;

plot(x,polyval(pc,x),'b-');

txt = sprintf('Best fit line y=%.2fx + %.2f',pc(1),pc(2));

legend('Data points',txt);

**Lab Task**

Calculate and plot a best fit line for this data set.

t=[0:8]; y=[40.12 66.78 80.17 86.71 80.77 66.78 44.41 10.51 -32.60];

Find:

1. What is the slope and intercept?

Hint: relate to polyfit coefficients

1. What is the value of y when t=4.5 and t=8.5

Hint: polyval

1. Use interp1 for part 2 - why the different values

**Deliverables**

Submit single word file with matlab code and screen shot of Output.