PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas **WEEK:** 10

EMAIL: neildouglas@cmail.carleton.ca **OFFICE:** CSAS, 4th Floor MacOdrum Library

COURSE: ECOR2606 **OFFICE HOURS:** Fridays 3:00 pm to 4:00 pm

Opener

Core concepts covered today:

- Interpolation
  - Difference between interpolation and regression
  - Finding an interpolating polynomial for a set of data using MATLAB
  - Finding an interpolating polynomial for a set of data using Newton's formula

Quick Activity: Difference between interpolation and regression

Fill in the table below. You may want to look at the Lecture 18 slides for help.

Regression	Interpolation
Used to find a curve (of some chosen form) that:	Used to find a curve that can:
The curve must to pass through all of the points. True or False?	The curve must pass through all of the points. True or False?
p = polyfit(x,y,n): n is _____ the number of data points minus one. Fits a _____ order polynomial to the data.	p = polyfit(x,y,n): n is _____ the number of data points minus one. Fits an _____ to the data.

PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas **WEEK:** 10

EMAIL: neildouglas@cmail.carleton.ca **OFFICE:** CSAS, 4th Floor MacOdrum Library

COURSE: ECOR2606 **OFFICE HOURS:** Fridays 3:00 pm to 4:00 pm

Activity 1

The following MATLAB code uses polynomial interpolation and all data points to estimate the value of y at x=4.3 and x=7.8. It also plots the data points and the interpolating polynomial on the same graph. All you need to do is fill in the blanks!

```
% Our data points:
x = [2 4 6 8];
y = [5 7 10 18];

p = __________(x,y,___); % Fits the interpolating
polynomial (IP) to the data

% The code below evaluates the interpolating polynomial
at 100 evenly spaced values of x between 2 and 8.
xIP = linspace(2,8,100);
yIP = _____________(p,xIP);

% Figure(1) created below is a plot containing the data
points and the interpolating polynomial
figure(1)
title('Graph of Data Points & Interpolating
Polynomial')
xlabel('x')
ylabel('y')
plot(x,y,'___') % Used to plot just the data points
grid on

_____________
plot(_______,_______,'--') % Used to plot the IP
_____________

% The code below outputs the estimated value of y at
x=4.3 and x=7.8 (i.e. outputs the value of the IP at
these points).
fprintf('The estimated value of y at x=4.3 is %f\n',
polyval(_______,_______))
fprintf('The estimated value of y at x=7.8 is %f\n',
polyval(_______,_______))
```

PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas **WEEK:** 10

EMAIL: neildouglas@cmail.carleton.ca **OFFICE:** CSAS, 4th Floor MacOdrum Library

COURSE: ECOR2606 **OFFICE HOURS:** Fridays 3:00 pm to 4:00 pm

Activity 2

Determine the equation of the interpolating polynomial for the data in Activity 1 using Newton's formula. What is the value of the interpolating polynomial at x=4.3 and x=6?

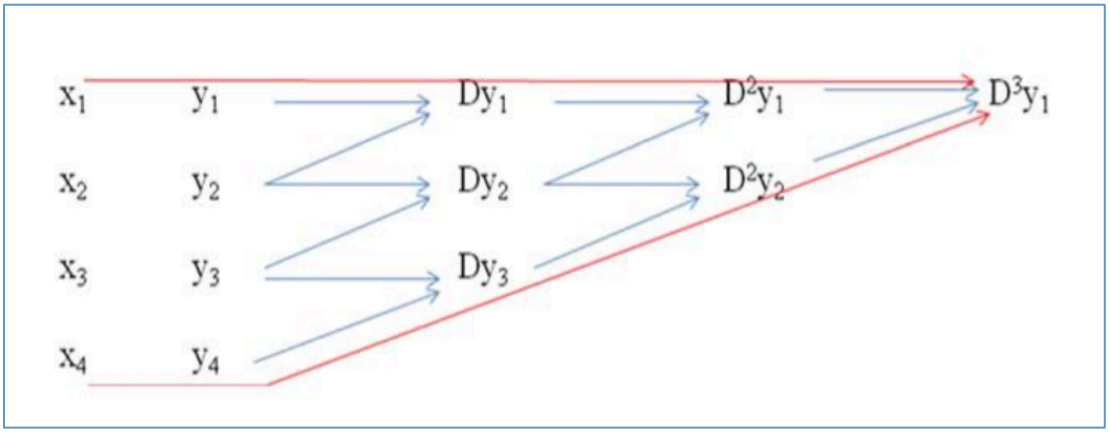
x	y
2	5
4	7
6	10
8	18

Here's what you are given on your formula sheet for Newton's interpolating polynomials:

$$p(x) = a_1 + a_2(x - x_1) + a_3(x - x_1)(x - x_2) + \ldots + a_N(x - x_1)\ldots(x - x_{N-1})$$

$$a_1 = y_1 \quad a_2 = Dy_1 \quad a_3 = D^2 y_1 \quad \ldots \quad a_N = D^{N-1} y_1$$

$$Dy_i = \frac{y_{i+1} - y_i}{x_{i+1} - x_i} \quad D^2 y_i = \frac{Dy_{i+1} - Dy_i}{x_{i+2} - x_i} \quad D^k y_i = \frac{D^{k-1} y_{i+1} - D^{k-1} y_i}{x_{i+k} - x_i}$$



PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas
EMAIL: neildouglas@cmail.carleton.ca
COURSE: ECOR2606
WEEK: 10
OFFICE: CSAS, 4th Floor MacOdrum Library
OFFICE HOURS: Fridays 3:00 pm to 4:00 pm

Homework: Try finding the interpolating polynomial for this data set using Lagrange's method.

PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas **WEEK:** 10

EMAIL: neildouglas@cmail.carleton.ca **OFFICE:** CSAS, 4th Floor MacOdrum Library

COURSE: ECOR2606 **OFFICE HOURS:** Fridays 3:00 pm to 4:00 pm

Closer

Believe it or not, soon it will be time for me to start preparing your mock final!

So, this week I would like know what are some of the non-MATLAB topics that you would like to see on it. Note there will be some MATLAB questions on it as well, but for now I want to hear about the manual stuff.

Write down three post-midterm topics that we have covered so far that you would most like to see covered on the mock-final.

Just as a refresher, here are the main (non-MATLAB) topics that we have covered since the midterm:

- Solving series of linear equations
  - Using Gaussian Elimination
  - Using Gauss-Jordan Elimination
  - Using the Jacobi Method
  - Using the Gauss-Seidel Method
  - Using LU Factorization
- Curve-fitting
  - Fitting a linear regression (straight line) to a data set
  - Fitting a general least squares regression to a data set ($Z^T Za = Z^T y$)
  - Fitting special functions to a data set
    - Exponential growth/decay equations
    - Power equations
    - Saturation growth rate equations
- Interpolation
  - Newton's method for finding interpolating polynomials
  - Lagrange's method for finding interpolating polynomials (NO I WILL NOT DO THIS!!)