

Objectives for 121 Final Exam: For this exam you should be able to:

General:

- use operations, structures and concepts covered in exam 1 & exam 2 as needed to solve problems
- solve problems using functions (expect at least one problem asking you to write a function)
- copy graphs, functions, and command window material into a word processing program and organize into a coherent solution

Structured Programming:

- use both for and while loop structures in MATLAB (guaranteed to be on the exam)
- explain what will happen in a given loop structure with given inputs
- describe and identify the three different types of program blocks (sequential, conditional, iterative)
- use the above mentioned structures (for and while loops) to solve a problem
- debug a defective code using the above structures
- clearly document a computer solution to a problem

Descriptive Statistics:

- calculate the mean and standard deviation for a set of data
- describe the nature of the mean and standard deviation
- plot a histogram of a set of data including adjusting the number and/or placement of the bins
- name, describe, create and interpret the three different types of histograms (absolute frequency, relative frequency, and scaled frequency)
- use standard deviation to make judgments about data. (e.g., compare the expected variation based on the mean, standard deviation and the normal distribution to a desired specification).

Empirical Models:

- empirically determine and fit the appropriate linear, power or exponential function to a set of data
- empirically determine the best order, and fit a polynomial to a set of data
- discern which of the previous two approaches is most likely to succeed in a given case
- use multiple linear regression to fit data with two independent variables in MATLAB
- plot both the data and the fitted function for an empirically determined model
- plot and interpret residual plots

Final Exam:	Section 1 (4:30 pm)	Wednesday, May 7 th , 4 – 6 pm
	Section 2 (9:00 am)	Monday, May 5 th , 8-10 am

- No make up exams will be given
- Closed book and notes
- You may use a (8.5 x 11) sheet of paper with your own unique notes to be turned in with exam.
- Accessing the internet during the exam will result a failing grade on the exam.

Practice Problems on Polynomial Regression and Multiple Linear Regression
Not Due – Solution will be posted

1. Table 2 presents the drying time (t) for a paint as a function of the amount of an additive (A).
 - a. Find the first-, second-, third- and fourth-degree polynomials that fit the data and plot each polynomial with the data. Evaluate each fit using a residuals plot (either residuals versus fits or residuals versus the independent variable).
 - b. Which polynomial do you recommend using to fit the data?
 - c. Using your “best fit” estimate the amount of additive that minimizes the drying time.

Table 2: Paint drying times

A (oz.)	0	1	2	3	4	5	6	7	8	9
t (min.)	130	115	110	90	89	89	95	100	110	125

2. The number of twists y required to break a certain rod is a function of the percentages x_1 and x_2 of each of two alloying elements present in the rod. Table 3 gives some pertinent data. Use multiple linear regression to obtain a model $y = a_0 + a_1x_1 + a_2x_2$ of the relationship between the number of twists and the alloy percentages. In addition, find the maximum percent error in the prediction.

Table 3: Twists to breakage for different alloy compositions

<i>Number of twists</i>	<i>Percentage of element 1</i>	<i>Percentage of element 2</i>
y	x_1	x_2
40	1	1
51	2	1
65	3	1
72	4	1
38	1	2
46	2	2
53	3	2
67	4	2
31	1	3
39	2	3
48	3	3
56	4	3