

Name _____

EXCEL EA-1 Quiz 3 version 2
July 21st, 2016

Please show your work or describe your reasoning. Do not simply mark an answer without explanation.

NOTE: there are problems on the back of this sheet!

Problem 1: Linear models

A linear model is an equation designed to explain experimental data, having the form

$$\hat{y} = a_1 f_1(x) + a_2 f_2(x) + a_3 f_3(x) + \dots$$

For n data points (x, y) , the equation above can be written as a matrix equation with n rows for the model predictions \hat{y}_i as $X\vec{a} = \hat{y}$. The “best-fit” coefficients a_1, a_2, \dots are found by solving the matrix equation:

$$X^T X \vec{a} = X^T y$$

where y are the observed values and \hat{y} are the predicted values from the model.

- (a) Consider a linear model of the form $\hat{y} = a_1 \sin\left(\frac{\pi x}{2}\right) + a_2$. For the following experimental data, find the matrix X . **BE CAREFUL: THIS IS NOT THE SAME EQUATION AS ON THE PREVIOUS QUIZ!**

x	y
0	0.1
1	1.5
2	1.5
3	1.25

- (b) Setup, **but do not solve**, the system of equations $X^T X \vec{a} = X^T y$ (i.e. calculate the matrix $X^T X$ and the vector $X^T y$).

Problem 2: for and while loops

Assume that the Workspace has been cleared. Write a program using a **while** loop which produces the same output.

Original MATLAB Code:	Your MATLAB code:
<pre>for n = [1, 2, 4, 8, 16] disp(n) end</pre>	

Problem 3: while loops

Assume that the workspace and command window have been cleared. What is the output from the following script? **Remember, only the lines highlighted in grey will produce output.**

MATLAB Code	Output
<pre>a = 1; b = 7; c = 1; while a <= b a = a + c b = b - c c = c + 1 end end_sum = a + b + c</pre>	

List one concept that confuses you, or one question you would like me to answer