Applied Math I - Test #1

Professor Broughton Oct 2, 1998

Name:_____ Box #_____

Instructions

- Answer all the questions directly on the test.
- Show all the necessary work and write your answers out neatly in English sentences. Use mathematical notation to express your answers, not Maple/Matlab notation
- It is not necessary to use your computer to answer all of the questions but you can use it to obtain graphs, evaluate functions, solve equations, etc. If you use Maple be sure to say so by some sentence such as: Using Maple/Matlab the above integral equals ....
- Recall that you may use notes that you can …t on one standard sheet of paper. On your computer you may start o¤ with one blank Maple/Matlab worksheet only. Please hand in your sheet of notes with your test.

Question	Points
1	
2	
3	
4	
Total	

1.a Solve the following system of using Gauss elimination and then back substitution. Show your steps.

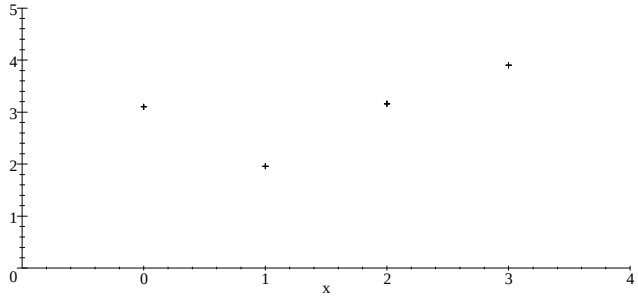
$$\begin{aligned} 2x + 4y - z + w &= 1 \\ 2x + 4y - 4z + 3w &= 8 \\ 3x + 7y - 2z + 3w &= 5 \end{aligned}$$

1.b Is there a solution that meets the coordinate plane hyperplane $y = 0$?

2. Write out the system of equations corresponding to the following spring system. Solve for the displacements.

3. Consider the following data in table and graph form:

obs#	1	2	3	4
x_i	0	1	2	3
y_i	3:1	1:96	3:16	3:9



3.a What type of polynomial …t make better sense for these data - linear or quadratic?

3.b Determine the coe¢cients for your …tting polynomial: Make sure you show your steps, and saying explicitly what the model matrix A; the vector of coe¢cients x; and the vector of observations b are.

3.c Sketch the graph of your …tting polynomial on the graph above.

4 Consider the following two matrices. $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 3 & 6 \end{bmatrix}$; $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \end{bmatrix}$

Select the matrix with a one dimensional range and compute the range and nullspace.

4.b Compute the projection operator onto the range of the matrix selected in part a.