MAS 3105 April 4, 2014
Quiz 6 and Key Prof. S. Hudson

1) Find the best Least Squares fit by a linear function for this data. One of the incomplete GE calculations below might help a little.

x	y
-1	0
0	1
1	3
2	9

$$\begin{pmatrix} 4 & 2 & 13 \\ 2 & & 21 \end{pmatrix} \to \begin{pmatrix} 1 & 1/2 & 13/4 \\ 0 & & 29/2 \end{pmatrix} \quad and \quad \begin{pmatrix} 3 & 4 & 1 \\ 3 & & 8 \end{pmatrix} \to \begin{pmatrix} 1 & 4/3 & 1/3 \\ 0 & & 7 \end{pmatrix}$$

2) In P_3 with inner product $\int_0^1 fg\, dx$, compute proj $_x$ x^3.

3) Choose ONE of these to prove (on the back).

a) Thm 5.2.1: The Fundamental Subspace Theorem (include both directions).

b) Thm 5.3.2: If A has rank n, then the normal equations have a unique solution.

c) The product of two orthogonal matrices is also orthogonal. Include the definition of *orthogonal* and at least a few words about your reasoning.

Remarks and Answers: The average was about 55, with highs of 100 and 78, but with several very low scores or non-attendance. The scale is

A's 66 - 100
B's 56 - 65
C's 46 - 55
D's 36 - 45

The semester average is about 75, for the best 5 of 6 quizzes, among the best 11 students (including two who did not take Quiz 6). The rough scale is

A's 79 - 100
B's 69 - 78
C's 59 - 68
D's 49 - 58

1) $f(x) = 2.9x + 1.8$. This was exercise 5.3.5 and is similar to an example in the book, also done in class. A common mistake was to put the 8 numbers directly into a matrix A.

2) $3x/5$, from $\langle x, x^3 \rangle = 1/5$, etc.

3) See the text for a. For b, you can use the text proof or can follow HW 5.2.13. Part c is easy if you use the theorem about $Q^TQ = I$ (and it is probably very hard without that).