MAS 3105 March 24, 2011

Quiz 6 and Key Prof. S. Hudson

1) Let S be the subspace of R^3 spanned by $\mathbf{x} = (2, 1, 1)^T$. Find a basis of $S^\perp$.

2) In $C[0, \pi]$ with inner product $\int_0^\pi fg\ dx$, compute $\langle e^{2x}, e^{-2x} \rangle$.

3) Choose ONE of these.

a) Prove thm 5.1.1; that for nonzero vectors $\mathbf{x}, \mathbf{y} \in R^2$, $\mathbf{x^T y} = ||x||\ ||y||\ \cos(\theta)$.
b) Thm 5.3.2: If A has rank n, then the normal equations have a unique solution.
c) Derive the normal equations, used to solve least squares problems.

Remarks and Answers: The Q6 average was about 42 / 60, with mostly good scores on problems 1 and 2, but very mixed results on the proof. The scale for Q6 is:

A's 46 to 60
B's 40 to 45
C's 34 to 39
D's 28 to 33
F's 0 to 27

I've updated your estimated semester grade, including this quiz and HW1-6, but not your lowest quiz grade, nor the MHW. See the upper right corner. If you opted out of the HW, your average may be inaccurate [I subbed HW=80, for now]. Answers:

1) You were supposed to use the F.S.Thm from Ch.5.2. But most people used ad hoc methods and did OK. One answer is $\{[-1, 1, 1]^T, [0, 1, -1]^T\}$. Every good answer should include two vectors, by the theorem, dim S + dim $S^\perp = n = 3$.

2) π

3) See the text. Both b and c were announced. The proof of b could use the textbook proof, but was also one of your previous hw's.