MAS 3105 Feb 28, 2014
Quiz 4 and Key Prof. S. Hudson

1) Let $S$ be the subspace of $P_4$ consisting of all polynomials of the form $ax^2 + bx + 4b$. Find a basis for $S$.

2) Find all values of $k$ such that $[k+1, k+2, k+3]^T$ is in the column space of $A$:

$$A = \begin{pmatrix} 1 & 1 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$$

3A) Answer True of False. If you would prefer to write a proof, you can cross out this problem and answer 3B instead. You can assume all matrices below are 3 by 3, and can ask about abbreviations.

If some set of 100 vectors spans $V$, then $V$ is finite dimensional.

If the rows of $A$ are LD then the rows of $AB$ are also LD.

If $A$ is nonsingular then rank $A$ = rank $AB$.

If $B$ is row equivalent to $I$ then the column space of $B$ is $R^3$.

If $B$ is row equivalent to $A$ then the column spaces of $A$ and $B$ are equal.

3B) This is an optional substitute for 3A). Don't do both 3A and 3B.

Show that if $n$ vectors span $V$ and dim $V = n$, then the vectors are LI. (Prove part of the "2/3" theorem. Don't quote it.)

**Remarks:** Very strange results. The top 6 students did better on this quiz than their semester average so far. All others did worse. The average among the top 15 students was approx 56. The highs were 100 and 100, but there were NO scores between 55 and 80. The not-very-meaningful scale is

A's 68 - 100
B's 58 - 67
C's 48 - 57
D's 38 - 47

The drop date (I think) is March 17, and I leave this to you. I have written your semester average in the upper right, as usual. It is based on your 4 quiz scores so far. But your worst was weighted only half as much, since there is a good chance it won't count later. The average for this stat is 69, with highs of 100 and 95 - both impressive! The rough scale is

A's 78 - 100
B's 68 - 77
C's 58 - 67
D's 48 - 57

If your current semester score is below 58, you have rather poor chances to pass with a C, *unless* you improve some work habits. If below 50, you are very unlikely to pass, even with increased effort. Of course, I will factor in the HW and MHW scores later. For now, that is a bit hard to do in any precise way, and I have no scale yet for those grades. See me if you need help with any of this.

**Answers:**

1) Basis $= \{x^2, x+4\}$. There is no need for column vectors here - just factor out the a, b. A very common problem was to give an answer in strange notation (column vectors, matrices, etc). I gave partial credit for that when possible.

2) $k = -4$. My intended method was to solve the system $A\mathbf{x} =$ the given vector. It is inconsistent (the usual $0 =$ nonzero equation) unless you set $k = -4$. Instead, some people set $c_1\mathbf{x}_1 + c_2\mathbf{x}_2 =$ the given vector, and did some simple algebra to get the same result.

3A) TTFTF

3B) See the text. Only 2 people chose 3B.