MAS 3105 Feb 10, 2004
Quiz 5 and Key Prof. S. Hudson

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1) Answer TRUE or FALSE:

a) If A is similar to B then $A - 4I$ is similar to $B - 4I$.

b) If A is similar to a singular matrix then A is also singular.

c) If A represents a $60°$ rotation of R^2 then $A^6 = I$.

d) If A and B are row equivalent, they have the same column space.

e) If A represents $L : R^3 \to R^2$ then Col $(A) = L(R^3)$.

2) Find the transition matrix from $[\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}]$ to $[\mathbf{u_1}, \mathbf{u_2}, \mathbf{u_3}]$ where:

$$\mathbf{v_1} = (4, 6, 7)^T, \mathbf{v_2} = (0, 1, 1)^T, \mathbf{v_3} = (0, 1, 2)^T$$

$$\mathbf{u_1} = (1, 1, 1)^T, \mathbf{u_2} = (1, 2, 2)^T, \mathbf{u_3} = (2, 3, 4)^T$$

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

a) If A and B are row equivalent, they have the same row space.

b) Suppose that $L : V \to W$ is linear and S is a subspace of V. Prove that $L(S)$ is a subspace of W.

c) The dimension of Col(A) equals the dimension of Row(A).

Answers: 1) TTTFT

2) This was a HW problem. Set $S = U^{-1}V$ (maybe from an arrow diagram), which is easiest to get from $[U|V] \to [I|S]$.

$$S = \begin{pmatrix} 1 & -1 & -2 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

3) These proofs are in the textbook [though I think my proof of c) is clearer than the book's].