MATH430/603

quiz #0, 02/03/15

Total 100

Show all work legibly.

1. (20) If A is an $n \times n$ matrix, and $\{\mathbf{b}_1, \ldots, \mathbf{b}_k\} \subset \mathbf{R}^n$ so that the vector set $\{A\mathbf{b}_1, \ldots, A\mathbf{b}_k\}$ is linearly dependent. True of False? The vector set $\{\mathbf{b}_1, \ldots, \mathbf{b}_k\}$ is linearly dependent.

   Mark one and explain.

   ▫ True ▫ False

2. (20) Let

$$A = \begin{bmatrix} 1 & 0 & 7 & 2 & 5 \\ 2 & 1 & 15 & 0 & 20 \end{bmatrix}.$$

Find dim Null A.

dim Null $A =$

3. (20) Let $\{\mathbf{a}_1, \ldots, \mathbf{a}_n\}$ be a linearly independent vector set. True of False? If the the entries b_{ij} of the matrix B are defined by $b_{ij} = \mathbf{a}_i^T \mathbf{a}_j$, then $\det B \neq 0$ (i.e. rank $B = n$, and n columns of B are linearly independent).

Mark one and explain.

▫ True ▫ False

4. (20) True of False? If $A = A^T$, then the eigenvalues λ_i are all real, and $\mathbf{v}_i^T \mathbf{v}_j = \delta_{ij}$.

Mark one and explain.

▫ True ▫ False

5. (20) True of False? If A is an $n \times n$ matrix and $\lambda_1, \ldots, \lambda_n$ are the eigenvalues of A, then tr $(A) = \lambda_1 + \ldots + \lambda_n$.

Mark one and explain.

▫ True ▫ False

6. (20) True of False? If $S = -S^T$ (is skew–symmetric), then $I + S$ is nonsingular.

Mark one and explain.

▫ True ▫ False