Math 270 HW#4

Name:_____ Date:_____

Show your work very clearly, neatly, and box your final answer.

One Side Only

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1. $\mathbf{A^T}$ means the transpose of matrix $\mathbf{A}$. Give a definition of transpose of a matrix.

2. Given $A=\begin{bmatrix} 2 & 5 & 3 \\ -3 & 6 & 0 \\ 4 & 1 & 1 \end{bmatrix}$, find

a) A^T

b) $\frac{1}{2}\left(A+A^T\right)$, what do you conclude about your answer?

c) $\frac{1}{2}\left(A-A^T\right)$, what do you conclude about your answer?

3a. What is an idempotent matrix? Give an example.

3b. Determine a and b such that matrix $A = \begin{bmatrix} 1 & 0 \\ a & b \end{bmatrix}$ is idempotent.

4a. What is a symmetric matrix? Give an example.

4b. What is a skew-symmetric matrix? Give an example.

5. Suppose $2\mathbf{A}^2 - 3\mathbf{A} + 2\mathbf{I} = \mathbf{0}$, $\mathbf{A}$ is a square matrix, Isolate $\mathbf{I}$, and facor the other side with $\mathbf{A}$ being one of the factors.

6. If $\mathbf{A}$ is an idempotent matrix, Find $(\mathbf{I} - 2\mathbf{A})^2$. What do you conclude?

7. Given: $\mathbf{u} = \begin{bmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}^T$, find $\mathbf{u}^T\mathbf{u}$.