544 Exam 4 Spring 1997

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PRINT Your Name:_____

There are 10 problems on 5 pages. Each problem is worth 10 points. SHOW your work. CIRCLE your answer. **CHECK** your answer whenever possible. **NO CALCULATORS.**

1. Define "linear transformation". A linear transformation is a function $T: \mathbb{R}^n \to \mathbb{R}^m$ with
   1) $T(v+w) = T(v) + T(w)$ for all v and $w \in \mathbb{R}^n$
   2) $T(cv) = cT(v)$ for all $c \in \mathbb{R}$ and $v \in \mathbb{R}^n$.

2. Define "eigenvalue". The number λ is an eigenvalue of the square matrix A if there is a vector v, with $v \neq 0$, such that $Av = \lambda v$.

3. True or False. If the statement is true, then PROVE the statement. If the statement is false, then give a COUNTEREXAMPLE. If A and B are 2×2 matrices, then $\det(A+B) = \det A + \det B$.

False Take $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ $\det A = \det B = 0$ but $\det(A+B) = 1$.