Math 216 Midterm 1 Study Guide

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Properties of matrices

- Some matrix A has the **existence property** if solutions must exist no matter what the contstants on the right hand side are. A matrix has the existence property if:
  1. There are *no* rows of zero in $rref(A)$
  2. (Alternately) There is a pivot in every row of A
- Some matrix A has the **uniqueness property** if (possible) solutions must be unique. A has uniqueness if:
  1. There are no **free variables** in $rref(A)$
  2. (Alternately) There is a pivot in every column of A
- If A is $m \times n$ (rows by columns):
  1. If $m > n$ (more equations than variables, tall + thin) we can't have universal existence
  2. If $m < n$ (short + wide) A can't have uniqueness
- If N has existence, then:
$$SN = TN \rightarrow S = T$$

1 Assorted

- $(AB)^{-1} = B^{-1}A^{-1}$
- **Adjoint** is defined as:
$$A^{-1} = \frac{adj(A)}{det(A)}$$
- For some matrix A, $A\text{adj}(A) = |A|I$

2 Determinants

- A matrix is invertible iff $det(A) \neq 0$