3.4 <u>Inverses</u>

<u>Note:</u> Suppose T is a one-to-one and onto transformation from vector space $\mathcal{V}$ to vector space $\mathcal{W}$. Then we can defind one-to-one and onto transformation $T^{-1}(w) = v$ whenever $T(v) = w$. T^{-1} is called the <u>*inverse*</u> of T.

<u>Note:</u> We can find A^{-1} for a $n \times n$ matrix A as follows:

(a) Create the "double matrix" $[A|I]$.

(b) Row reduce A down to I (if possible) while simultaneously performing the same operations on the right side of the"double matrix". The I on the RHS will be transformed into A^{-1}: $\left[I|A^{-1}\right]$.

<u>Theorem</u> 1 *Let A be an invertible matrix. Then $AA^{-1} = A^{-1}A = I$*

<u>Theorem</u> 2 *Let A be $n \times n$. If either one of the following holk, then A is invertible and $B + A^{-1}$:*

(a) There is a matrix B such that $AB = I$;

(b) There is a matrix B such that $BA = I$.