# Homework Assignment 1

Due September 5, 8:30am

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## 1 Problems

1. Show that $(AB)^T = B^T A^T$. Do this using dot products and the notation introduced in class for the rows and columns of matrices.

2. Show that $A(BC) = (AB)C$, in other words, that matrix multiplication is associative. Do this using dot products and the notation introduced in class for the rows and columns of matrices.

3. Give an example of two 2x2 matrices such that $AB \neq BA$

4. Let $A$ and $B$ be matrices. If $BA = B$ can we conclude that $B = I$? Either prove it or find a counter example.

5. A *subspace* of a vector space is a subset that satisfies two requirements:

   (a) If we add any vectors $x$ and $y$ in the subset, their sum is in the subset

   (b) If we multiply any vector $x$ in the subset by any scalar $c$, the multiple $cx$ is in the subset

   In other words, a *subspace* is a subset which is closed under addition and scalar multiplication.

   (a) Consider all vectors in $\mathcal{R}^2$ whose components are greater than or equal to zero. Is this a subspace? Justify your answer

   (b) Consider all positive real numbers. Define "+" (vector addition) as $x$"+"$y = xy$. Define $cx$ to be the usual $x^c$ where $c$ is any real number. Show that this set with these definitions is a vector space