

204: Homework 2 Due February 2

1. Prove that matrix multiplication is associative.
2. Let $f : X \rightarrow Y$. Prove that f has a left-inverse if and only if it is injective. Prove that it has a right inverse if and only if it is surjective.
3. Suppose $\lim_{n \rightarrow \infty} x_n = L$. Prove that every subsequence of (x_n) also converges to L .
4. Find two 2-by-2 matrices A and B that are not linearly dependent, have every entry non-zero, and satisfy $AB = BA$.
5. For each of the following matrices, find its rank and its nullity.

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$
$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$
$$\begin{pmatrix} 1 & 2 & -1 \\ 3 & 4 & 1 \end{pmatrix}$$
$$\begin{pmatrix} 1 & 3 \\ 2 & 4 \\ -1 & 1 \end{pmatrix}.$$