Written assignment 1, MATH 133 – Vectors, Matrices and Geometry

Submit by Friday, May 21, 12:00. Either submit in class or in the mailbox on the 10-th floor of Burnside Hall.

1. Prove that in $\mathbb{R}^2$ the distance between parallel lines with equations $\mathbf{n} \cdot \mathbf{x} = c_1$ and $\mathbf{n} \cdot \mathbf{x} = c_2$ is given by $\frac{|c_1 - c_2|}{\|\mathbf{n}\|}$.

2. What are the possible reduced echelon forms of a 3×3 matrix?

3. Suppose that $S = \{v_1, \ldots, v_k, v\}$ is a set of vectors in some $\mathbb{R}^n$ and that v is a linear combination of $v_1, \ldots, v_k$. If $S' = \{v_1, \ldots, v_k\}$ prove that $\mathrm{Span}(S) = \mathrm{Span}(S')$.

4. If A is a 3×5 matrix, explain why the columns of A must be linearly dependent.