MATH 105: Homework 1

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5 Multivariable Calculus

3. Prove the following.

Theorem 1. *Let $T : V \to W$ be a linear transformation between normed spaces. Then,*

$$\begin{aligned} \|T\| &= \sup\{|Tv| \ : \ |v| < 1\} \\ &= \sup\{|Tv| \ : \ |v| \leq 1\} \\ &= \sup\{|Tv| \ : \ |v| = 1\} \\ &= \inf\{M \ : \ v \in V \implies |Tv| \leq M|v|\} \end{aligned} \tag{1}$$

4.

6.

12.

13.