

**1. Property of a norm**

We know that if  $f : v \rightarrow \mathbb{R}$  is a norm, then  $f(\lambda x) = |\lambda|f(x)$ . Prove this.

**2. True or False?**

Can three vectors in the  $\mathbb{R}^2$  plane have  $u \cdot v < 0$  and  $v \cdot w < 0$  and  $u \cdot w < 0$ ?

### 3. Transformations

- (a) You would like to unwrap a matrix

$$A_{\text{matrix}} = \begin{bmatrix} A_{1,1} & A_{1,2} \\ A_{2,1} & A_{2,2} \end{bmatrix}$$

to get the vector,  $A_{\text{vector}} = [A_{1,1} \ A_{1,2} \ A_{2,1} \ A_{2,2}]^T$ . Can you construct a matrix (or a set of matrices) that can achieve this?

- (b) You would like to extract a subsequence of a vector to do computations over it. For instance, you'd like to extract  $[x_i, x_{i+1}, \dots, x_{i+m}]^T$  from a vector  $X = [x_1, x_2, \dots, x_N]^T$ . Find a set of matrix transformations you would need to do this.