Homework 1 - Linear Algebra

Distance in $\mathbb{R}^n$

Let $u, v \in \mathbb{R}^n$. The distance between u and v is $\text{dist}(u, v) = ||u - v||$

Example

1. Compute the distance between the vectors $u = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $v = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

Example

2. Compute the distance between the vectors $u = \begin{bmatrix} 7 \\ 1 \\ -1 \end{bmatrix}$ and $v = \begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$

Problems

3. Let $u = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$ and $v = \begin{bmatrix} 4 \\ 6 \end{bmatrix}$. Then find

a. $u \cdot v$

b. $\frac{u \cdot v}{v \cdot v} v$

c. $\frac{u}{||u||^2}$

4. Find unit vector in the direction of the following vectors.

a. $u = \begin{bmatrix} -30 \\ 40 \end{bmatrix}$

b. $u = \begin{bmatrix} \frac{7}{4} \\ \frac{1}{2} \\ 1 \end{bmatrix}$

5. Find the distance between $u = \begin{bmatrix} 0 \\ -5 \\ 2 \end{bmatrix}$ and $u = \begin{bmatrix} -4 \\ -1 \\ 8 \end{bmatrix}$