Homework 2

Math 171H (section 201), Fall 2023

This homework is due on **Tuesday, August 29** at the start of class.

1. Compute $\langle 2, 3 \rangle + \langle -1, 1 \rangle$, and illustrate this sum geometrically.

2. Compute the unit vector in the same direction as $\hat{i} - \hat{j}$.

3. Prove the 5 facts about dot products, except the ones we already did in class.

4. Which of these make sense? Which don't? Explain.

   (a) $(\underline{\mathbf{v}} \cdot \underline{\mathbf{w}}) \cdot \underline{\mathbf{u}}$

   (b) $(\underline{\mathbf{v}} \cdot \underline{\mathbf{w}}) \, \underline{\mathbf{u}}$

   (c) $|\underline{\mathbf{v}}| \, (\underline{\mathbf{w}} + |\underline{\mathbf{u}}|)$

   (d) $|\underline{\mathbf{v}}| \, (|\underline{\mathbf{w}}| + |\underline{\mathbf{u}}|)$

5. (a) Give examples of *unit vectors* $\underline{\mathbf{v}}$ and $\underline{\mathbf{w}}$ for which $\underline{\mathbf{v}} \cdot \underline{\mathbf{w}} = 1$.

   (b) Give examples of vectors $\underline{\mathbf{v}}$ and $\underline{\mathbf{w}}$ that are NOT unit vectors, for which $\underline{\mathbf{v}} \cdot \underline{\mathbf{w}} = 1$.

6. How many unit vectors are orthogonal to $\langle -1, 1 \rangle$? (Draw them.) Prove your answer.

7. Find scalars c and d for which $c\langle 1, 1 \rangle + d\langle 1, 0 \rangle = \langle -1, -4 \rangle$. Are there any more pairs (c, d)? Prove your answer.