Teaching Assitant

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Office hours:

Wednesday / Friday 11:45 AM - 12:45 PM
McHenry Library Cafe

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Reflection

Take a moment to think about what was covered last class and what is due on upcomming assignments. Which concepts, techniques, etc. feel clear and doable? Which, if any, could use more explanation or practice?

Warm Up

Discuss the following with your groups

Give plain language definitions for the following terms:

- Dot Product
- Orthogonality
- Projection (of a Vector)

For vecotrs $u, v \in \mathbb{R}^4$, give two formulas for $u \cdot v$ and one for $\operatorname{proj}_u v$.

If real vecotrs u and v are orthogonal, what can we say about their dot product and their projection?

Problems 1 and 2

9.3.2

Determine if the following pairs of vectors are "parallel," "orthogonal," or "neither."

$\mathbf{a} = \langle -1, -2, 2 \rangle$ and $\mathbf{b} = \langle 4, 8, 10 \rangle$.

$\mathbf{a} = \langle -1, -2, 2 \rangle$ and $\mathbf{b} = \langle 4, 8, -8 \rangle$.

$\mathbf{a} = \langle -1, -2, 2 \rangle$ and $\mathbf{b} = \langle 2, 4, -5 \rangle$.

9.3.3

Given $\vec{u} = \langle 0, 5, -4 \rangle$, $\vec{v} = \langle -2, 0, 3 \rangle$, and $\vec{w} = \langle -3, 0, 1 \rangle$, compute

$\vec{u} \cdot \vec{w}$.

$(\vec{u} \cdot \vec{v}) \cdot \vec{u}$.

$((\vec{w} \cdot \vec{w}) \cdot \vec{u}) \cdot \vec{u}$.

$\vec{u} \cdot \vec{v} + \vec{v} \cdot \vec{w}$.

9.3.12

Consider the triangle in $\mathbb{R}^3$ given by $P = (3,2,-1)$, $Q = (1,-2,4)$, and $R = (4,4,0)$.

a. Find the measure of each of the three angles in the triangle, accurate to 0.01 degrees.

b. Choose two sides of the triangle, and call them vecotrs that form the sides (emanating from a common point) $\mathbf{a}$ and $\mathbf{b}$.

   i. Compute $\text{proj}_{\mathbf{a}}\,\mathbf{b}$ and $\text{proj}_{\perp\mathbf{b}}\,\mathbf{a}$.

   ii. Explain why $\text{proj}_{\perp\mathbf{b}}\,\mathbf{a}$ can be considered a height of triangle PQR.

   iii. Find the area of the given triangle.

Problem 4

9.3.13

Let u and v be vectors in $\mathbb{R}^5$ with $u \cdot v = -1$, $|u| = 2$, $|v| = 3$, and θ the angle between u and v. Find each of the following

a. $u \cdot 2v$.

b. $v \cdot v$.

c. $(u+v) \cdot v$.

d. $(2u+4v) \cdot (u-7v)$.

e. $|u||v|\cos(\theta)$.

f. θ.

Attendance