

Admin Notes / Agenda

- Warm Up
- Schedule Review
- Tech Lab 4

Warm Up

Instructions: Complete the problems below as a warm-up activity. For each, show your reasoning and computation clearly. Answers will be provided on the next page.

Vector Angle Review

For each pair of vectors below:

1. Compute the dot product $\mathbf{u} \cdot \mathbf{v}$.
2. Determine whether the vectors are orthogonal.
3. If they are not orthogonal, compute the angle θ between them using

$$\cos \theta = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}||\mathbf{v}|}.$$

Round any angle measurements to the nearest degree.

(a)

$$\mathbf{u}_1 = \langle 2, -1, 3 \rangle, \quad \mathbf{v}_1 = \langle 1, 4, -2 \rangle$$

(b)

$$\mathbf{u}_2 = \langle 1, 2, -1 \rangle, \quad \mathbf{v}_2 = \langle 2, -1, 1 \rangle$$

Matrix Multiplication Problem

Instructions: Confirm the multiplication is possible by checking inner dimensions. Then compute the product MP .

$$M = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 3 & 1 \end{bmatrix}, \quad P = \begin{bmatrix} 1 & 0 \\ 2 & 1 \\ -1 & 3 \end{bmatrix}.$$

Worked Answers

Vector Angle Review Answers

(a) $\mathbf{u}_1 \cdot \mathbf{v}_1 = 2(1) + (-1)(4) + 3(-2) = -8.$
 $|\mathbf{u}_1| = \sqrt{14}, |\mathbf{v}_1| = \sqrt{21},$ so

$$\cos \theta = \frac{-8}{\sqrt{14} \cdot \sqrt{21}} \Rightarrow \theta \approx 107^\circ.$$

(b) $\mathbf{u}_2 \cdot \mathbf{v}_2 = 1(2) + 2(-1) + (-1)(1) = -1.$
 $|\mathbf{u}_2| = \sqrt{6}, |\mathbf{v}_2| = \sqrt{6},$ so

$$\cos \theta = \frac{-1}{6} \Rightarrow \theta \approx 100^\circ.$$

Matrix Multiplication Answer

$$MP = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 3 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 1 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} -1 & 6 \\ 4 & 6 \end{bmatrix}.$$