## Problem 1

Let $\vec{u}=2 i+3 j-4 k$ and $\vec{v}=-i+2 j+2 k$. Find $\vec{u} \cdot \vec{v}$ and the angle between them.

## Problem 2

For two arbitrary vectors, $\vec{u}$ and $\vec{v}$ in $\mathbb{R}^{3}$, show that $\vec{u} \cdot \vec{v}=\vec{v} \cdot \vec{u}$ and $(\overrightarrow{c u}) \cdot \vec{v}=\vec{u} \cdot(\overrightarrow{c v})$ for any constant $c$.

## Problem 3

Find 2 different vectors that are orthogonal to the vector $\langle 1,2,3\rangle$.

## Problem 4

Let $A$ be the triangle with vertices at the points $(1,1),(2,5)$ and $(4,3)$. Determine the 3 interior angles of $A$.

## Problem 5

A water main is to be constructed with a $20 \%$ grade while headed in the north direction and then takes a right turn to continue at a $10 \%$ grade in the east direction. Find the angle at the corner of the pipes. (see 11.3 problem 16 for a picture)

