

Mathematics 189-133B, Winter 2003
Vectors, Matrices and Geometry
Written Assignment 10, due in class, April 9, 2003

1. Show that if P is an orthogonal matrix, then if $\vec{v}$ and $\vec{w}$ are nonzero vectors, the angle between $\vec{v}$ and $\vec{w}$ is the same as the angle between $P\vec{v}$ and $P\vec{w}$. Recall that the angle θ between $\vec{v}$ and $\vec{w}$ is determined by the fact that

$$\cos(\theta) = \frac{\vec{v} \cdot \vec{w}}{\|\vec{v}\| \|\vec{w}\|}.$$

2. Show that the only possible real eigenvalues of an orthogonal matrix are ± 1 .

(In these problems, you want to write $\vec{u}^T \vec{v}$ for $\vec{u} \cdot \vec{v}$ sometimes.)