QUIZ December 4, 2013

Clicker Instructions: A = True; B = False;
C = I don't know; D = No truth value

correct = 1pt; don't know = 0pt; wrong = 0pt

1. Any orthogonal set of vectors is linearly dependent.

2. For any vector $\mathbf{v}$, we have

$$\mathbf{v} \cdot \mathbf{v} > 0.$$

3. (Note: Your text writes proj_L where L is a line. I will sometimes write $\mathrm{proj}_{\mathbf{v}}$ when L is the line spanned by vector $\mathbf{v}$.) If $\mathbf{b}_1, \ldots, \mathbf{b}_n$ is an orthogonal basis for $\mathbb{R}^n$, and $\mathbf{y}$ is a vector in $\mathbb{R}^n$, then $\mathbf{y}$ is the sum of its projections onto $\mathbf{b}_1, \ldots, \mathbf{b}_n$, i.e.

$$\mathbf{y} = \mathrm{proj}_{\mathbf{b}_1}(\mathbf{y}) + \cdots + \mathrm{proj}_{\mathbf{b}_n}(\mathbf{y}).$$

4. An orthonormal matrix U (i.e. one with orthonormal columns) preserves dot product, i.e.

$$(U\mathbf{x}) \cdot (U\mathbf{y}) = \mathbf{x} \cdot \mathbf{y}.$$

This implies that the mapping described by U preserves lengths and orthogonality.

5. A rotation matrix is orthonormal.

6. If $\mathbf{y}$ is a vector in $\mathbb{R}^n$, and W is a subspace of $\mathbb{R}^n$, then the closest point on W to $\mathbf{y}$ is the orthogonal projection

$$\mathrm{proj}_W(\mathbf{y}).$$

7. If $\mathbf{y}$ is a vector in $\mathbb{R}^n$ and W is a subspace of $\mathbb{R}^n$, and $\mathbf{y}$ is in W, then $\mathrm{proj}_W(\mathbf{y}) = \mathbf{0}$.