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D. Handron

Homework #15: Due on Friday, December 7.

1. (a) Let

$$\mathbf{u} = \begin{bmatrix} 2\\1\\2 \end{bmatrix}.$$

Find an orthonormal basis \mathcal{B} for \mathbb{R}^3 that includes $\frac{\mathbf{u}}{||\mathbf{u}||}$ as the *third* vector.

- (b) Let S denote the standard basis in \mathbb{R}^3 , $S = \{\mathbf{e}_1, \mathbf{e}_2, \mathbf{e}_3\}$. Find the change of basis matrices $P_{S \leftarrow S}$ and $P_{B \leftarrow S}$.
- (c) The standard matrix for a rotation through the angle θ around the z-axis in \mathbb{R}^3 is

$$\begin{bmatrix} \cos\theta & -\sin\theta & 0\\ \sin\theta & \cos\theta & 0\\ 0 & 0 & 1 \end{bmatrix}$$

using a change of coordinates, find the standard matrix for a rotation through an angle θ around the axis span(**u**). [Note there are two acceptable answers: one for a clockwise rotation and one for counterclockwise.]

- 2. [Poole, Section 6.4, Problem #32.]
- 3. [Poole, Section 5.4, Problem #24.]
- 4. [Poole, Section 6.6, Problem #46.]