

Name:

PID:

1. Recall that $\mathbf{k} = \langle 0, 0, 1 \rangle$. Also, \mathbf{k}^T is the transpose of \mathbf{k} .

Give explicitly the 3×3 matrices that represent the following four linear maps on \mathbb{R}^3 .

(a) $\mathbf{x} \mapsto \text{Proj}_{\mathbf{k}}(\mathbf{x}) = (\mathbf{k}\mathbf{k}^T)\mathbf{x}$. (The projection of \mathbf{x} onto \mathbf{k} .)

(b) $\mathbf{x} \mapsto \mathbf{x} - (\mathbf{k}\mathbf{k}^T)\mathbf{x}$. (The component of \mathbf{x} perpendicular to \mathbf{k} .)

(c) $\mathbf{x} \mapsto \mathbf{x} \times \mathbf{k}$.

(d) $\mathbf{x} \mapsto \mathbf{k} \times (\mathbf{x} \times \mathbf{k})$.