WORKSHEET 10/23/23
MATH 2331, FALL 2023

(1) Calculate $Q^T Q$, where $Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$.

(2) Based on your answer to #1, guess a formula for $Q^T Q$ when the columns of Q are orthonormal.

(3) Based on your answer to #2, is Q invertible?

(4) Show that $|\vec{x} - \vec{y}|^2 = |\vec{x}|^2 + |\vec{y}|^2$ if $\vec{x}$ and $\vec{y}$ are orthogonal. Does this remind you of anything?

(5) Let A be an $m \times n$ matrix, $\vec{b}$ a vector in $\mathbb{R}^n$, and $V = \text{im}(A)$. Is the system $A\vec{x} = \text{proj}_V(\vec{b})$ consistent?