

Name:

1. Suppose B is a 7×3 matrix. Consider the block matrix:

$$A = \begin{bmatrix} I & 0 \\ B^T & I \end{bmatrix}.$$

Determine the dimensions of each identity matrix and the zero matrix. Be sure in your answer to distinguish between the two identity matrices.

2. Let $a_1 = (1, -1)$ and $a_2 = (2, 0)$. I've done the Gram Schmidt algorithm on these two vectors and have determined that

$$q_1 = \frac{1}{\sqrt{2}}(1, -1), \quad q_2 = \frac{1}{\sqrt{2}}(1, 1).$$

I also found that $\tilde{q}_1 = (1, -1)$ and $\tilde{q}_2 = (1, 1)$ along the way.

a) Now let

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix}.$$

Observe that the columns of A are exactly a_1 and a_2 . Compute the QR factorization to determine matrices Q and R where Q has orthonormal columns and R is upper triangular such that

$$A = QR$$

- b) Verify that your previous answer worked. That is, multiply Q and R and show that you recover A .