

Linear Algebra (MA20105)
Assignment-2
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1. Apply the Gram–Schmidt process to the vectors $\beta_1 = (1, 0, 1)$, $\beta_2 = (1, 0, -1)$ and $\beta_3 = (0, 3, 4)$ to obtain an orthonormal basis for \mathbb{R}^3 with the standard inner product. Let $A = (\beta_1^t, \beta_2^t, \beta_3^t)$. Then write $A = QR$ where Q is an orthogonal matrix and R is an upper triangular matrix. 5 Marks
2. Let W be a subspace of \mathbb{R}^2 spanned by the vector $(3, 4)$. Using the standard inner product, let E be the orthogonal projection of \mathbb{R}^2 onto W . Find:
 - (a) a formula for $E(x_1, x_2)$;
 - (b) the matrix of E in the standard ordered basis;
 - (c) W^\perp
 - (d) an orthonormal basis in which E is represented by the matrix

$$\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}.$$

5 Marks