Quiz 5 (Oct 9) Name: Unique ID:

1. (10 points) Find elementary matrices $E_1, E_2, \ldots, E_k$ such that $E_k \cdots E_2 E_1 \begin{bmatrix} 1 & 2 \\ -1 & 0 \\ 3 & 7 \end{bmatrix}$ is in echelon form. (You do not need to multiply $E_k \cdots E_2 E_1$ together.)

2. (a) (5 points) Let A be an $m \times n$ matrix. Prove that $A^\top A$ is symmetric.

   (b) (5 points) Suppose that A is an $n \times n$ matrix satisfying $A^\top A = I_n$, and that $\mathbf{v} \in \mathbb{R}^n$ is a vector satisfying $A\mathbf{v} = 3\mathbf{v}$. Show that $\mathbf{v} = \mathbf{0}$. (*Hint:* Consider $\|A\mathbf{v}\|$.)