This is a continuation of an exercise seen in class. What are the 1-norm and the $\infty$-norm of (real) matrices of the form $A = uv^T$?

(a) Calculate $\|A\|_1, \|A\|_\infty$ for the matrix: $A = \begin{pmatrix} 1 & 6 & 0 \\ 6 & -1 & 3 \\ -2 & 3 & 5 \end{pmatrix}$

(b) Among all vectors $x$ satisfying $\|x\|_\infty \leq 1$ find one for which $\|Ax\|_\infty$ is the largest possible.

(c) Among all vectors $x$ satisfying $\|x\|_1 \leq 1$ find one for which $\|Ax\|_1$ is the largest possible.

Let $Q \in \mathbb{C}^{n \times n}$ be a unitary matrix and $A$ any $n \times n$ matrix.

(a) Do we have $\|AQ\|_2 = \|A\|_2$? $\|Q^HA\|_2 = \|A\|_2$? (b) Same questions if $Q \in \mathbb{C}^{n \times p}$, with $n > p$, is orthogonal (i.e. is such that $Q^HQ = I$).