Math 1553 Worksheet §§3.4-3.6

- **1.** True or false (justify your answer). Answer true if the statement is *always* true. Otherwise, answer false.
 - a) If *A* is a 3 × 4 matrix and *B* is a 4 × 2 matrix, then the linear transformation *Z* defined by Z(x) = ABx has domain \mathbb{R}^3 and codomain \mathbb{R}^2 .

b) If *A* is an $n \times n$ matrix and the equation Ax = b has at least one solution for each *b* in \mathbb{R}^n , then the solution is *unique* for each *b* in \mathbb{R}^n .

c) Suppose *A* is an $n \times n$ matrix and every vector in \mathbb{R}^n can be written as a linear combination of the columns of *A*. Then *A* must be invertible.

2. Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be rotation *clockwise* by 60°. Let $U : \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation satisfying U(1,0) = (-2,1) and U(0,1) = (1,0).

a) Find the standard matrix for the composition $U \circ T$ using matrix multiplication.

b) Find the standard matrix for the composition $T \circ U$ using matrix multiplication.

c) Is rotating clockwise by 60° and then performing *U*, the same as first performing *U* and then rotating clockwise by 60° ?