ME 115(a): Homework #2

(Due Monday, February 3, 2014)

Problem 1: (10 points) Can every orthogonal matrix be represented by the exponential of a *real* matrix? That is, if $A \in \mathcal{O}(n)$, can A be represented by

$$A = e^C$$

for some *real* matrix C? (Hint: the determinant of e^C can be expressed as an exponential of a scalar.)

Problem 2: (15 points) Do Problem 4(a,b,c) in Chapter 2 of MLS. (*hint 1:* you can assume the solution to one part of the problem in solving the other parts.) (*hint 2:* for part (c), if you don't remember the definition of a vector space, you can look at Wikipedia, or see the optional handout on the course website entited "A Brief Introduction to Algebraic Systems.")

Problem 3: (5 points) Do Problem 5(c) in Chapter 2 of MLS.

Problem 4: (10 points) Do Problem 8(b,c) in Chapter 2 of MLS.

Problem 5: (5 points) Do Problem 10 (b) in Chapter 2 of MLS. Do not worry about the question of surjectivity.

Problem 6: (5 points) Consider the following rotation matrix:

$$\begin{bmatrix} 0.866025 & -0.353553 & 0.353553 \\ 0.353553 & 0.933013 & 0.0669873 \\ -0.353553 & 0.0669873 & 0.933013 \end{bmatrix}$$

Find the axis of rotation and angle of rotation associated with this rotation.