

**ME 115(a): Homework #2**

(Due Wednesday Jan 28, 2004 at 5:00 pm)

**Problem 1:**

- (a) Do problem 3(c) in the MLS text.
- (b) Let

$$R = \begin{bmatrix} r_{11} & r_{12} & r_{13} \\ r_{21} & r_{22} & r_{23} \\ r_{31} & r_{32} & r_{33} \end{bmatrix}$$

be a matrix in  $SO(3)$ . Show that  $\text{cof}(r_{ii}) = r_{ii}$  for matrices in  $SO(3)$ .

**Problem 2:** Do Problem 4(a,b) in Chapter 2 of MLS.

**Problem 3:** 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.)

**Problem 4:** Consider the following rotation matrix:

$$\begin{bmatrix} 0.882772 & -0.416266 & 0.217798 \\ 0.44976 & 0.882772 & -0.135756 \\ -0.135756 & 0.217798 & 0.966506 \end{bmatrix}$$

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

**Problem 5:** Do Problem 8(b) in Chapter 2 of MLS.