

## GG631 Problem Set #2: Einstein Summation & Vector Rotation

### 1. Einstein summation

Calculate the values of both (a) and (b) below for both a three-dimensional ( $i, j = 1, 2, 3$ ) and a four-dimensional ( $i, j = 1, 2, 3, 4$ ) coordinate system.

- a.  $\delta_{ii}$
- b.  $\delta_{ij}\delta_{ij}$

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### 2. Vector rotations

Vector  $\mathbf{a}=[1 \ 0 \ 0]$  is rotated  $30^\circ$  counterclockwise about the z-axis, and then  $60^\circ$  counterclockwise about the x-axis to give vector  $\mathbf{b}$ .

- a. What is the vector  $\mathbf{b}$ ?
- b. What is the vector  $\mathbf{c}$ , which is formed by performing the same rotations in the reverse order?
- c. Is  $\mathbf{b}$  the same as  $\mathbf{c}$ ? Why or why not?