

Week 5 worksheet
(due Monday, July 10 at the beginning of class)

1. Find the determinants of the following matrices (show your work):

$$\begin{bmatrix} 2 & 4 \\ -1 & 3 \end{bmatrix} \quad \begin{bmatrix} 2 & 5 & -2 \\ 3 & 1 & 2 \\ -1 & -2 & 4 \end{bmatrix} \quad \begin{bmatrix} 3 & 0 & 0 & 0 \\ 1 & -2 & 0 & 0 \\ 4 & 2 & -1 & 0 \\ 3 & 7 & 2 & 4 \end{bmatrix} \quad \begin{bmatrix} 2 & 9 & -5 & 3 & 9 \\ 3 & 1 & 5 & -3 & 1 \\ 0 & -4 & 1 & 2 & -4 \\ 8 & 5 & 6 & 9 & 5 \\ 3 & -2 & -1 & -3 & -2 \end{bmatrix}$$

2. Find all values λ for which the matrix equation $B\mathbf{x} = \mathbf{0}$ has a nontrivial solution, where

$$B = \begin{bmatrix} 1 - \lambda & 1 \\ -2 & 4 - \lambda \end{bmatrix}.$$

3. Use determinants and cofactors to find the inverse of $\begin{bmatrix} 1 & 3 & 2 \\ 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$.

4. Find the linearization of the spherical change of coordinates map:

$$f(\rho, \phi, \theta) = (\rho \cos \theta \sin \phi, \rho \sin \theta \sin \phi, \rho \cos \phi).$$

5. Find the factor by which the linear map you found in #4 scales volume.