PHYS 301
HOMEWORK #6

Due : 21 Feb. 2014

1. Use the properties of the Kronecker delta and the Levi - Civita permutation tensor to determine the values of :

$$\delta_{ij}\,\delta_{jk}\,\delta_{km}\,\delta_{im} \qquad\qquad \epsilon_{ijk}\,\delta_{jk}$$

2. Use Einstein summation notation to prove the identity :

$$\nabla \cdot (f\,\mathbf{g}) = \mathbf{g} \cdot \nabla f + f\,(\nabla \cdot \mathbf{g})$$

where f is a scalar function and **g** is a vector.

3. If **r** is the position vector :

$$\mathbf{r} = x\,\hat{\mathbf{x}} + y\,\hat{\mathbf{y}} + z\,\hat{\mathbf{z}}$$

(and r represents the magnitude of the position vector), use the identity above to evaluate the expression

$$\nabla \cdot \left(r^3\,\mathbf{r}\right)$$

4. Use Einstein summation notation to determine the value of the expression :

$$\mathbf{A} \cdot (\mathbf{B} \times \mathbf{A})$$