ADVANCED DYNAMICS — PHY 4241/5227

HOME AND CLASS WORK – SET 15

(April 20, 2009)

(62)

1. Write $\left(\vec{a} \times \vec{b}\right)^k$ using ϵ^{klm} and the summation convention. Due April 17 in class (1 point).
2. Write $\left[\nabla \times \left(\vec{a} \times \vec{b}\right)\right]^i$ using $\epsilon^{ijk}\partial_j$ and the summation convention. Due April 17 in class (1 point).
3. Perform in the last expression the sum over k. Due April 17 in class (1 point).
4. Show that the last expression agrees with

$$\left(\nabla \cdot \vec{b}\right) \vec{a} + \left(\vec{b} \cdot \nabla\right) \vec{a} - (\nabla \cdot \vec{a}) \vec{b} - (\vec{a} \cdot \nabla) \vec{b}.$$

   Due April 20 in class (2 points).

(63) Apply the vector identity of the previous assignment to $\nabla \times \left(\vec{B} \times \vec{v}\right)$. Discuss which terms on the r.h.s. are zero and omit them. Due April 20 in class (3 points).

(64) Consider the differential equation

$$L\frac{d^2Q}{dt^2} + R\frac{dQ}{dt} + \frac{Q}{C} = \epsilon_{\max} e^{-i\omega t} \ .$$

1. Determine Q_0 for the special inhomogeneous solution $Q_i = Q_0 \exp(-i\omega t)$. Due April 22 in class (2 points).
2. Find the general homogeneous solution from the ansatz $Q_h \sim \exp(i\alpha t)$. Due April 22 in class (4 points).