Homework I

Posted on 29th January, Due on 7th Feb

1). Let $\vec{\lambda}$ λ be the separation vector from a fixed point (x',y',z') to the point (x,y,z), and let λ be its length. Show that

(a) $\nabla(\lambda^2) = 2\,\vec{\lambda}$

(b) $\nabla(1/\lambda) = -\hat{\lambda}/\lambda^2$

© What is the general formula for $\nabla(\lambda^n)$

2). Prove that the divergence of a curl is always zero; and the curl of a gradient is always zero.

3). Prove

(a) $\nabla\times(f\vec{A}) = f(\nabla\times\vec{A}) - A\times(\nabla f)$

(b) $\nabla\times(\vec{A}\times\vec{B}) = (\vec{B}\bullet\nabla)\vec{A} + (\nabla\bullet\vec{B})\vec{A} - (\vec{A}\bullet\nabla)\vec{B} - (\nabla\bullet\vec{A})\vec{B}$

4). $\int \delta(f(x))g(x)dx = ?$