Physics 8100 - Electromagnetic Theory I

Fall 2017

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Assignment # 1 (due to on Monday, September 06, 2017)

1) Show that $\vec{A} \bullet (\vec{B} \times \vec{C}) = (\vec{A} \times \vec{B}) \bullet \vec{C}$

2) Show that $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B} \bullet (\vec{A} \bullet \vec{C}) - \vec{C} \bullet (\vec{A} \bullet \vec{B})$

3) Calculate $\nabla \times \nabla u, \qquad u \in \Re$

4) Calculate $\nabla \bullet (\nabla \times \vec{A})$

5) Show $\frac{d}{d\sigma}\left(u \cdot \vec{A}\right) = \vec{A} \cdot \frac{d\,u}{d\sigma} + u \cdot \frac{d\,\vec{A}}{d\sigma}$

6) Show $\frac{d}{d\sigma}\left(\vec{A} \bullet \vec{B}\right) = \frac{d\,\vec{A}}{d\sigma} \bullet \vec{B} + \vec{A} \bullet \frac{d\,\vec{B}}{d\sigma}$

7) Show $\nabla(u+v) = \nabla u + \nabla v; \qquad u,v \in \Re$

8) Show $\nabla(u \cdot v) = (\nabla u) \cdot v + u \cdot (\nabla v); \qquad u,v \in \Re$

9) Calculate $\nabla(\vec{c} \cdot \vec{r}); \quad \vec{c} = \text{arbitrary vector}, \quad \vec{r} = \text{coordinate vector}$

10) Calculate $\nabla \bullet \left(\vec{A} + \vec{B}\right)$

11) Calculate $\nabla \bullet \left(u \cdot \vec{A}\right)$

12) Calculate $\nabla \bullet \left(\vec{A} \times \vec{B}\right)$

13) Show $\nabla \times \left(u \cdot \vec{A}\right) = u \cdot \left(\nabla \times \vec{A}\right) + (\nabla u) \times \vec{A}$

14) Show $\nabla \times \left(\nabla \times \vec{A}\right) = \nabla \bullet \left(\nabla \bullet \vec{A}\right) - \Delta\vec{A}; \qquad \left[\Delta = \nabla^2\right]$