

ECEn 560
Electromagnetic Wave Theory

Homework #4

Due Jan. 26, 2010 in class

1. Magnetic charges have not been observed in nature, but it is often convenient in electromagnetics to use fictitious magnetic currents as an aid in solving problems. A magnetic current \overline{M} is a source in Faraday's law defined by $\nabla \times \overline{E} = i\omega\overline{B} - \overline{M}$. Derive a radiation integral for the electric field intensity radiated by a magnetic current source. (Hint: define an *electric* vector potential \overline{F} such that $\overline{D} = -\nabla \times \overline{F}$.)
2. (a) Represent an arbitrary 3×3 matrix A as a dyad $\overline{\overline{A}}$ (i.e., a linear combination of products $\hat{x}\hat{x}$, $\hat{x}\hat{y}$, etc). (b) Verify that $\overline{\overline{A}} \cdot \overline{b}$ gives the same result as matrix vector multiplication Ab , where b is a column vector. (c) Is the dyad $\hat{x}\hat{y}$ equal to the dyad $\hat{y}\hat{x}$?