

Physics 721 Homework 4

Assigned: Mon. 2/7/05

Due: Mon. 2/14/05

1. Current in an infinite straight wire is turned on abruptly at $t = 0$.

$$I(t) = \begin{cases} 0 & t < 0 \\ I_0 & t > 0 \end{cases} .$$

Assume that the wire remains neutral at all times: $\rho = 0$.

- a) Find $A^\mu(x)$. Assume that the boundary condition is that $A^\mu(x) = 0$ for $t < 0$ (which certainly specifies the necessary Cauchy data).
- b) From the potentials, determine \vec{E} and \vec{B} .
- c) Plot the magnitudes of the fields from part b) as a function of time.
- d) Find the energy flux at a distance R from the wire, given by the Poynting vector T^{0i} integrated over a cylindrical surface of radius R and length L .
2. Jackson 14.4 (pg. 699)
3. Jackson 12.16 (pg. 621)