Problem Set 6

Physics 322
Electrodynamics II

Due on Friday, March 1st, 2024

Problem 1

Griffiths 11.3 — effective resistance due to electric dipole radiation.

Problem 2

Griffiths 11.22 — radiation due to oscillation.

Problem 3

Griffiths 11.23 — radio engineering.

Problem 4

Griffiths 11.19 — the trouble with radiation reaction (for part a., assume that the external force is not a delta function).

Problem 5

Does a particle that moves with constant acceleration radiate? Does it experience a radiation reaction force?

Problem 6

The time-scale associated with radiation reaction is $\tau = \mu_0 q^2/(6\pi mc)$. What is this time-scale for an electron?

Problem 7

Extend the electric field notebook, shared on February 23rd (available from the course website) to compute the Poynting vector associated with the electric and magnetic fields. You can make contour plots of the magnitude of the Poynting vector to get a sense for where the radiated power is greatest, and how it evolves in time given some source motion $\mathbf{w}(t)$. We'll have a contest on Friday to see who can make the most interesting radiation patterns.