# Electromagnetic Theory II: Homework 17

Due: 13 April 2021

## 1 Potential produced by an orbiting charged particle

A particle with charge $q$ orbits at a constant speed $v$ in a circle of radius $R$. Determine the vector potential and the scalar potential at any point along the axis of orbit.

## 2 Potentials from a section of straight current

A section of wire from $x = 0$ to $x = a$ carries constant current flowing right with magnitude, $I_0$, starting at $t = 0$.

a) Determine an expression for the charge at $x = 0$ and $x = a$ such that charge is conserved.

b) Determine expressions for the scalar and the vector potential at $x > a$ and $t > x/c$.

c) Show that the scalar potential is exactly that which would be obtained from the two point charges without using the retarded time (i.e. assuming information that the variation of charge with time would reach the field point instantly).

d) Determine the electric field for $x > 0$ and $t > x/c$. Show that it is exactly that of a dipole.