# Week 11 Worksheet
# Magnetostatics!

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**Exercise 1.** The Lorentz force law for a particle of charge $q$ moving with velocity $\mathbf{v}$ in a magnetic field $\mathbf{B}$ is given by

$$F_{\text{mag}} = q\mathbf{v} \times \mathbf{B}.$$

Find an expression for the work that the magnetic force does on the particle.

**Exercise 2.** Find the magnetic field and vector potential due to a current which flows with constant surface density $\mathbf{K}$ along the surface of an infinite cylinder of radius $a$ in the following directions:

a) along the axis of the cylinder;

b) perpendicular to the axis of the cylinder;

c) at an angle $\alpha$ to the axis of the cylinder.

**Exercise 3.** ***Griffiths 5.13*.** Suppose you have two infinite, parallel line charges $\lambda$ a distance $d$ apart, which are moving at a constant speed $v$. How great would $v$ have to be for the magnetic attraction to balance the electrical repulsion? Calculate the number, and comment on the result.
*Hint*: The speed of light is

$$c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}.$$