1. A rectangular loop of wire (sides of length $a$ and $b$) lies on a table a distance $s$ from a very long straight wire carrying current $I$ as shown below.
(a) Find the flux of $\mathbf{B}$ through the loop.
(b) If someone pulls the loop directly away from the wire at speed $v$, what is the emf generated? In what direction (clockwise or counterclockwise) does the current flow?
(c) How does the answer to (b) change if the loop is pulled to the right at speed $v$ (instead of away)?

2. A circular loop of radius $a$ rotates at an angular speed $\omega$ in a uniform magnetic field as shown below.
(a) What is the emf induced in the loop?
(b) If the magnetic field is 100 mT, the radius of the loop is 5 cm, the resistance of the loop is 100 $\Omega$, and the rotation rate is $\omega = 200$ rad/s, what is the maximum current in the loop?
(c) Say the loop is stationary now and aligned perpendicular to the field (so the flux through it is a maximum). Now say the loop shrinks in time so its radius varies as $a(t) = a_0(1 - t/\tau)$. Find the emf in the loop.

3. Griffiths 7.12

4. Griffiths 7.15
5. Assume that the magnitude of the magnetic field outside a sphere of radius $R$ is $B = B_0 (R/r)^2$, where $B_0$ is a constant. Determine the total energy stored in the magnetic field outside the sphere and evaluate your result for $B_0 = 5 \times 10^{-5} \text{T}$ and $R = 6 \times 10^6 \text{m}$, values appropriate for the Earth’s magnetic field.

6. A long coaxial cable carries current in the inner cylinder (of radius $a$) uniformly distributed over its circular cross section. The current returns along the outer conducting shell of the cable (radius $b$). Find the self-inductance per unit length.

7. Griffiths 7.33

8. Griffiths 7.36