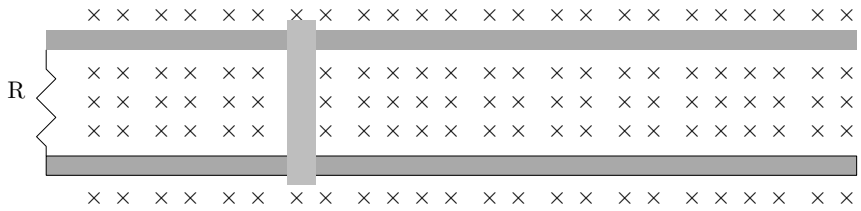
1. The flux through a loop is $\phi = 0.1t^2 + 4t$ in webers. What is the induced EMF as a function of time?

2. Consider the configuration below. The B-field is 1 T the rod speed is 10 m/s and the rods length is 0.1 m. What is the induced EMF of the circuit? If the resistor has resistance of 2Ω, what is the force needed to move the rod at constant speed?



3. Consider two coaxial solenoid with length L, but with radius r_1 and r_2 with $r_1 < r_2$. Solenoid 1 has N_1 turns and solenoid 2 has N_2 turns. What is their mutual inductance?

4. Consider a coaxial cable that consists of two thin conducting infinite cylinders with radius r_1 and r_2 with $r_1 < r_2$. The currents on the inner and outer are equal in magnitude, I, and opposite in direction. As an exercise in Ampere's law, find the magnetic field between the cylinders.

5. Consider the following circuit. At t=0, switch S is thrown. Find the power that flows through the resistor at t=0 and $t = 4$ seconds. At what time is the power half of what the power would be at $t = \infty$