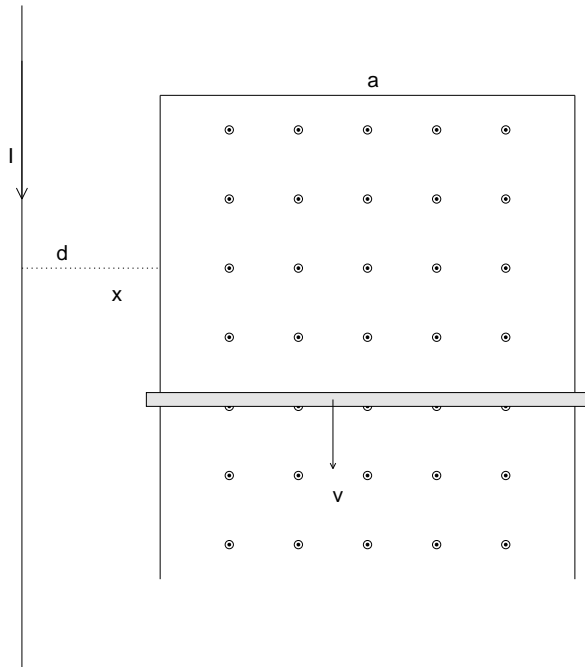


# Physics 202 Exam II additional problems

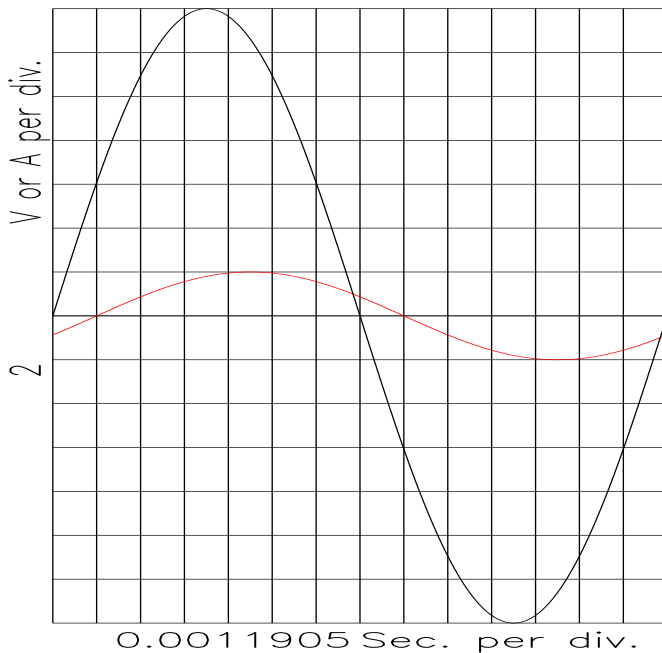
These are due at **8:00 AM sharp Thursday April 10.**

## Problem 1. 4 points



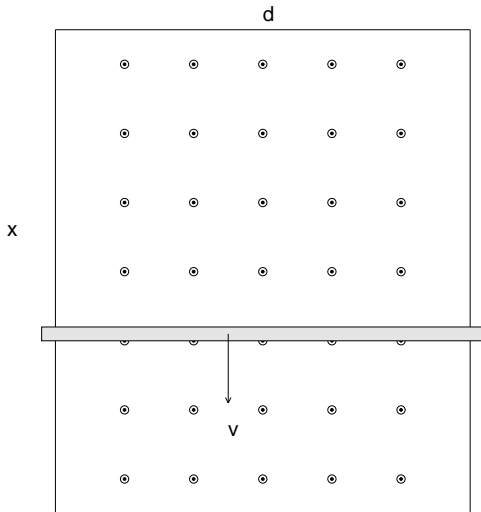
Consider a set of conducting rails with  $d = 10.0\text{ cm}$  and  $a = 20.0\text{ cm}$ , and a sliding conducting bar, the magnetic field is supplied by a parallel wire carrying constant current  $I = 10\text{ A}$ . Compute the induced emf across the rod, the force needed to move it at constant speed  $v = 10.0\frac{\text{m}}{\text{s}}$ , and the rate of thermal energy production in the rod. (3 + 3 + 4 points).

## Problem 2. 4 points



An AC circuit contains a generator, a resistor and one other device. The generator voltage is illustrated full-scale, the current is in red. The vertical scale is calibrated equally in both sets of units. Find  $\mathcal{E}_0$ ,  $R$ ,  $\phi$ ,  $Z$ ,  $\omega$ , and  $L$  or  $C$ . **Numerical answers only!** Circle your answers.

**Problem 3a. 4 points**



A sliding rod is forced to move at speed  $v = 5.0 \frac{m}{s}$  along wire tracks a distance  $d = 1.0m$  apart, threaded by a magnetic field  $\mathbf{B}$  normal to the paper, of strength  $0.08T$ . The rod has resistance  $R = 100\Omega$ . **Determine the direction of the induced current through the bar, the force required to move the rod at constant speed, and the power expended to do so.**

**Problem 3b. 4 points**

Suppose that instead of moving the bar, we let the magnetic field increase in strength according to  $|\mathbf{B}| = 0.01T \cos(100\pi \frac{rad}{s} t)$ . **Determine the induced current through the bar (including direction) and force required to hold the bar in place at position  $x = 1.0 m$  at  $t = \frac{1}{200} s$ .**