Problem 1
In the figure below, the rolling axle, 1.50 m long, is pushed along horizontal rails at a constant speed \( v = 3.00 \, \text{m/s} \). A resistor \( R = 0.400 \, \Omega \) is connected to the rails at point \( a \) and \( b \), directly opposite each other. The wheels make good electrical contact with the rails, and so the axle, rails, and resistor form a closed-loop circuit. There is a uniform magnetic field \( B = 0.800 \, \text{T} \) vertically downward. (a) Find the induced current in the resistor. (b) What horizontal force is required to keep the axle rolling at constant speed? (c) After the axle rolls past the resistor, does the current in the resistor reverse direction?

Problem 2
Three concentric loops of wire, each having 10 turns, are shown in the figure below. What is the magnitude (in A) and direction of the current in the outermost loop if the magnetic field at the center is \( 1.18 \times 10^{-4} \, \text{T} \) directed into the page?

Problem 3
Four very long parallel current-carrying wires lie in a plane as shown in the figure below. Their spacing is constant and the currents and directions are depicted in the figure. What is the ratio of the magnetic field \( |B_c/B_a| \), where points \( a \) and \( c \) lie halfway between the adjacent wires?