SHOW ALL WORK!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

The drawing shows a long straight wire carrying current to the right.

(a) If the current in the wire is $I_o$, calculate the magnetic flux through the rectangle beside the wire. Do the calculations; don’t just put down a formula.

(b) If the rectangle is a conductor with the resistance given, calculate an expression for the current in the rectangle as a function of time if the current in the straight wire is given by $I(t) = I_o e^{-kt}$.

(c) What will the direction of the current (clockwise or counter clockwise) in the rectangle be? Explain.

\[ \Phi = \frac{I}{2\pi} \int_0^{\alpha+b} \frac{1}{r} dr = \left[ \frac{\mu_0 I_o}{2\pi} c \ln \left( \frac{a+b}{a} \right) \right] \]

\[ B = \frac{I_o}{2\pi} \]

\[ E = -\frac{d\Phi}{dt} = -\frac{d}{dt} \left( \frac{\mu_0 I_o}{2\pi} c \ln \left( \frac{a+b}{a} \right) \right) = -\frac{d}{dt} \left( \frac{\mu_0 I_o}{2\pi} c \ln \left( \frac{a+b}{a} \right) \right) \]

\[ \frac{dI}{dt} = -\mu_0 \frac{c}{2\pi R} e^{-kI} \]

\[ I = \frac{\mu_0 c}{2\pi R} \ln \left( \frac{a+b}{a} \right) e^{-kt} \]

(c) The $B$ field is getting smaller so the $\Phi$ is getting smaller. The induced $B$ field will want to strengthen $B_{int}$, so a point into the page. The current by the RHR the 1st current will be clockwise.