(b) \[ \mathbf{E}_i = \mathbf{E}_0 \cos \theta \mathbf{i} \]

\[ \mathbf{E}_0 = \frac{\mu_0 I}{2\pi r} \]

\[ I = \frac{\mu_0 I}{2\pi} \]

\[ \mathbf{E}_i = \frac{\mu_0 I}{2\pi} \cos \theta \mathbf{i} \]

Induced \( \mathbf{E} \) is counterclockwise.

(b) \[ \frac{d\Phi}{dt} = \frac{\mu_0 I}{2\pi} \cos \theta \]

\[ \mathbf{E}_i = \frac{\mu_0 I}{2\pi} \cos \theta \mathbf{i} \]

Since \( \Phi \) increases at \( t = 0 \)

(a) \[ \mathbf{E}_i = \mathbf{E}_0 \mathbf{i} \]

(b) \[ \mathbf{E}_i = \frac{\mu_0 I}{2\pi} \cos \theta \mathbf{i} \]

If the current in the wire is given by \( I = I_0 \sin \omega t \), calculate the current through the resistor \( R \) as a function of time. Assume the positive direction of the current in the wire as shown by the arrow, and that the positive current in the long wire has a constant value 1 (new situation).

Now the current in the rectangle is changed by changing the value of \( R \). Calculate the current in the resistor, including its sign using the convention in (a).