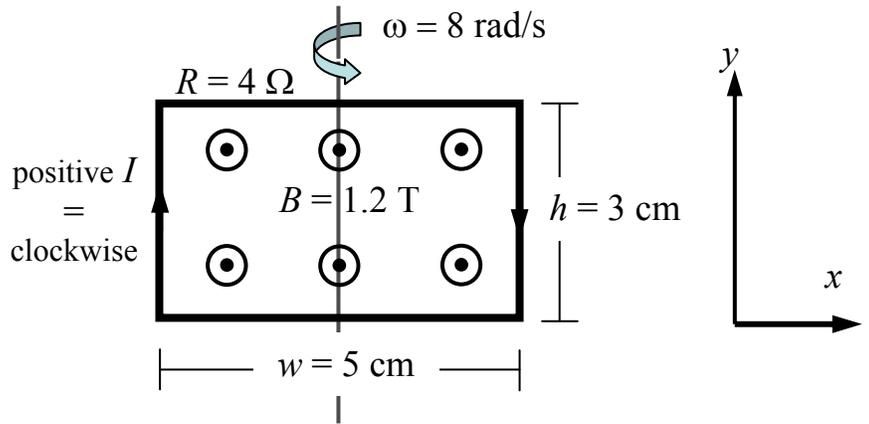


Discussion Question 9D
P212, Week 9
Faraday's Law: Rotating Loop

Consider a rectangular loop of wire with width w , height h , and total resistance R . The region of space occupied by the wire loop contains a uniform magnetic field B pointing out of the page.

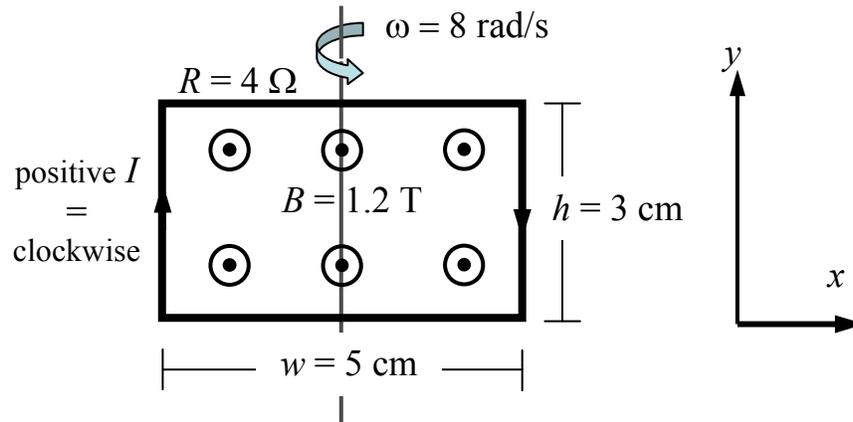


A motor attached to the loop keeps it rotating about the vertical axis with constant angular velocity ω . At time $t = 0$, the loop is parallel to the paper (as shown in the figure).

(a) Plot the magnetic flux Φ_B through the loop as a function of time. Find the maximum value (amplitude) of the flux, and write it on your plot.

(b) Plot the induced EMF \mathcal{E} through the loop as a function of time. Find the maximum value (amplitude) of the EMF, and write it on your plot.

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(c) Plot the induced current I through the loop as a function of time. Find the maximum value (amplitude) of the current, and write it on your plot.

(d) Plot the torque τ provided by the motor to keep the loop rotating at a constant angular velocity. Find the maximum value (amplitude) of the torque, and write it on your plot.