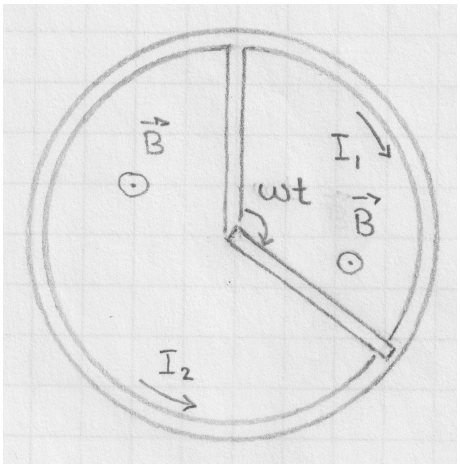
[lex75] Faraday wheel I

A conductor consists of two rods of length a and a ring of radius a. The ring and one rod are fixed in the positions and orientations shown. The other rod is forced to rotate about the center of the ring with constant angular velocity ω as indicated. The mobile rod is in sliding contact with the fixed rod and the ring. The currents flowing in the two segments of the ring delimited by the rods are I_1 and I_2 with their chosen directions indicated. A static and uniform magnetic field $\mathbf{B}$ directed $\odot$ (out of plane) is present. The ring has resistance R_c and each rod has resistance R_r. Determine the time-dependence of both currents I_1 and I_2 over the time interval of one rotation of the mobile rod and sketch a graphical representation of each current.



Solution: