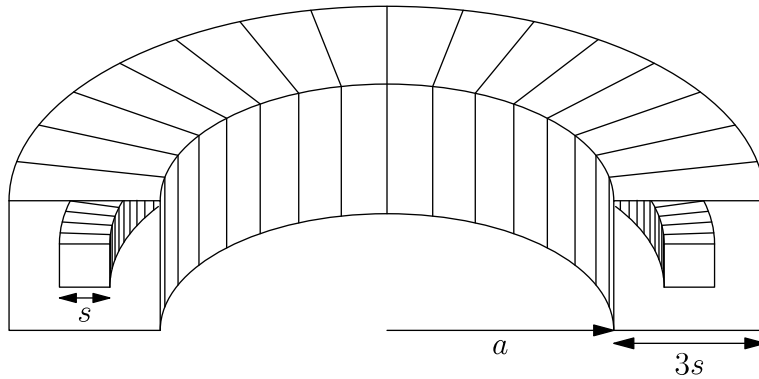


M00E.3—Toroidal Solenoids

Problem

The sketch shows two concentric toroidal solenoids. The outer one has N_1 turns of wire, each with square cross-section with side $3s$. The inner diameter of the outer solenoid is a , as shown in the figure. The inner solenoid has N_2 turns of wire, with square cross-section with side s . The resistance of the outer wire is negligible, but the resistance of the inner wire is \mathcal{R} .



- If an AC voltage of amplitude V_0 and angular frequency ω is applied to the outer wire, what is the power dissipated in the system? You may leave your answer in terms of parameters given and the inductances of the system.
- Find expressions for the relevant inductances.