Problem 5: (40 pts.) A closely-wound search coil with 200 turns, radius 0.01 m, and total resistance $60.0\,\Omega$ is placed at the center of a long solenoid. The solenoid is 0.25 m long and has 4000 turns of wire. The axes of the search coil and solenoid are aligned. (This is essentially the same geometry as you used in lab.) The current in the solenoid is given by

$$i(t) = 7.0 - 0.2t^2 \quad ,$$

(where i is in Amps and t is in seconds).

a. (30 pts.) What is the magnitude of the induced current in the search coil at time $t = 5\,\text{s}$? (You may ignore any fringing effects.)

b. (10 pts.) The induced current is due to an induced electric field $\vec{E}$ that is generated by the changing magnetic field $\vec{B}$. What is the *direction* of $\vec{S} = \frac{1}{\mu_0}\vec{E} \times \vec{B}$? Draw a small diagram showing the directions of $\vec{E}$, $\vec{B}$, and $\vec{S}$, and describe the direction of $\vec{S}$ *clearly* but briefly.