A long solenoid of radius 50 cm. has a current of 10 A in its windings which produces a magnetic field of 6 T in its interior directed into the page as shown in the figure. By decreasing the current, the field is caused to decrease at the rate of 96 T/s. (a) Calculate the magnitude of the induced electric field at 3 m for the center of the solenoid. (b) If a proton were located at 3 m from the center, describe what would happen to it (shape of path and direction of motion)?

\[
\phi = BA \\
= B \pi \left( \frac{1}{2} \right)^2
\]

\[
\mathcal{E} = -\frac{d\phi}{dt} = \frac{1}{4\pi} \frac{dB}{dt}
\]

\[
= \frac{1}{4\pi} (96)
\]

\[
= 24\pi
\]

\[
\mathcal{E} = \int \mathbf{E} \cdot d\mathbf{s} = E \oint ds \\
= E (2\pi R) \\
R = 3
\]

\[
24\pi = E 2\pi (3)
\]

\[
E = 4 \frac{V}{m}
\]

b) flux decreasing, thumb parallel

\[\Rightarrow\text{ Circle Clockwise}\]