Notes: Tutorial on Lenz's Law

p. 125: \( I_A \) and \( I_B \): use \( \vec{F} = q \vec{V} \times \vec{B} \)

\( I_B \): magnetic moment \( \vec{m} = (A I, \text{ direction } S \rightarrow N \text{ inside loop}) \)

\[ \begin{array}{c}
S \quad I \quad N \\
A \end{array} \]

\( \vec{m} \rightarrow \)

p. 126: area vector for a loop: \( \vec{A} \) area, i.e. two possible directions

\[ \Phi_m = \vec{A} \cdot \vec{B} = AB \cos \theta \]

Note: depending on your choice of direction of \( \vec{A} \), the flux will be positive or negative.
Both choices for \( \vec{A} \) are valid but be consistent.

p. 127: Lenz's Law:

There is an induced current in a closed, conducting loop if and only if the magnetic flux through the loop is changing.
The direction of the induced current is such that the induced magnetic field opposes the change in flux.

Tutorial on Faraday's Law

Faraday's law: \( |E| = \left| \frac{d\Phi_m}{dt} \right| \) (Magnitude)

An emf is induced in a loop if the magnetic flux through the loop changes.
Direction: the emf will drive a current with a direction found from Lenz's Law.