



**The induced emf and induced current are in such a direction as to oppose the cause that produces them.**

- Lenz's rule is a statement of negative feedback.
- The cause is a change in magnetic flux through some loop.
- The loop can be real or fictitious.
- What opposes the cause is a magnetic field generated by the induced emf.
  - If the loop is a conductor the opposing magnetic field is generated by the induced current as stated in the law of Biot and Savart or in the restricted version of Ampère's law.
  - If the loop is not a conductor the opposing magnetic field is generated by the induced electric field as stated by the extended version of Ampère's law (to be discussed later).

## Lenz's Rule (2)



In the situation shown below the current induced in the conducting ring generates a magnetic field whose flux counteracts the change in magnetic flux caused by the bar magnet.

- Moving the bar magnet closer to the ring increases the magnetic field  $\vec{B}_1$  (solid field lines) through the ring by the amount  $\Delta\vec{B}_1$ .
- The resultant change in magnetic flux through the ring induces a current  $I$  in the direction shown.
- The induced current  $I$ , in turn, generates a magnetic field  $\vec{B}_2$  (dashed field lines) in a direction that opposes the change of flux caused by the moving bar magnet.

