Magnetic Fields and Electromagnetism

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12.1 Magentic Fields

A magnetic field is a vector field that describes the magnetic force exerted on moving charges, electric currents, or magnetic materials. Since magnetic fields are created by magnetic dipoles, which always have a north and a south pole, magnetic field lines always form a closed loop: north to south outside a magnet and south to north inside a magnet.

Because magnetic poles always occur as dipoles, the net magnetic field through any closed surface will always be zero:

$$\oint B \cdot dA = 0$$