Chapter 29: Magnetic Fields Due to Currents

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General

Quantities

$$B = \text{magnetic field}$$
$$i = \text{current}$$
$$\mu_0 = \text{permeability constant}$$
$$R = \text{radius}$$
$$\phi = \text{angle of arc}$$
$$n = \text{number of turns per unit length of a solenoid}$$

Constants

$$\mu_0 = 4\pi \times 10^{-7} \, \frac{\text{T m}}{\text{A}}$$

1 Magnetic Field Due to a Current

Magnetic Field Due to a Current in a Long Straight Wire

$$B = \frac{\mu_0 i}{2\pi R} \tag{1}$$

Magnetic Field Due to a Current in a Loop of Wire

$$B = \frac{\mu_0 i}{2R} \tag{2}$$

Magnetic Field Due to a Current in a Circular Arc of Wire

$$B = \frac{\mu_0 i \ \phi}{4\pi R} \tag{3}$$

2 Solenoids

Magnetic Field Inside a Solenoid

$$B = \mu_0 i n \tag{4}$$