Notation for angle between position vector and current element in condition for straight conductor at biot savart law

$$\theta$$

Notation for angle between position vector and perpendicular to current element for straight conductor at biot savart law

$$\phi$$

Notation for distance between current element with point at the conductor for straight conductor at biot savart law

l

Notation for distance between point at the conductor and the position at for straight conductor at biot savart law

a

Derivation for Expression for distance of position vector in for straight conductor at biot savart law

- $$\theta + \phi = 90$$
- $$\theta = 90 - \phi$$
- $$\sin\theta = \sin(90 - \phi)$$
- $$\sin\theta = \cos\phi$$
- $$\cos\phi = \frac{a}{r}$$

- $$r = \frac{a}{\cos\phi}$$
- $$r = a\sec\phi$$

Expression for distance of position vector in for straight conductor at biot savart law

- $$r = a\sec\phi$$

Derivation for Expression for current element in terms of angle for straight conductor at biot savart law

- $$\tan\phi = \frac{l}{a}$$
- $$l = a\tan\phi$$
- Differentiating,
- $$dl = a\sec^2\phi d\phi$$

Expression for current element in terms of angle for straight conductor at biot savart law

- $$dl = a\sec^2\phi d\phi$$

Derivation for expression of differential equation of magnetic element for straight conductor at biot savart law

- $$dB = K\frac{Ia\sec^2\phi d\phi\cos\phi}{a^2\sec^2\phi}$$
- $$dB = \frac{\mu_0 I}{4\pi a}\cos\phi$$

Expression of differential equation magnetic element for straight conductor at biot savart law

- $$dB = \frac{\mu_0 I}{4\pi a}\cos\phi$$

Derivation for expression of general particular equation for straight conductor at biot savart law

- $$dB = \frac{\mu_0 I}{4\pi a}\cos\phi$$
- Integrating across ϕ_1 and ϕ_2
- $$B = \int_{-\phi_1}^{\phi_2} dB = \frac{\mu_0 I}{4\pi a}[\sin\phi_1 + \sin\phi_2]$$

Expression of general particular equation for straight conductor at biot savart law

$$B = \frac{\mu_0 I}{4\pi a}[\sin\phi_1 + \sin\phi_2]$$

Derivation for expression of magnetic field if points lie near the middle in infinitely large straight conductor in biot savart law

- $$\phi_1 = \phi_2 = 90$$
- $$B = \frac{\mu_0 I}{4\pi a}[\sin\phi_1 + \sin\phi_2]$$
- $$B = \frac{\mu_0 I}{2\pi a}$$

Expression of magnetic field if points lie near the middle in infinitely large straight conductor in biot savart law

- $$B = \frac{\mu_0 I}{2\pi a}$$

Derivation for expression of magnetic field if point lies near the end in infinitely large straight conductor in biot savart law

- $$\phi_1 = 90$$
- $$\phi_2 = 0$$
- $$B = \frac{\mu_0 I}{4\pi a}[\sin 90 + \sin 0]$$
- $$B = \frac{\mu_0 I}{4\pi a}$$

Expression of magnetic field if point lies near the end in infinitely large straight conductor in biot savart law

- $$B = \frac{\mu_0 I}{4\pi a}$$

Derivation for expression of magnetic field if point lies at the perpendicular bisector of conductor of finite length L at biot savart law

- $$\sin\phi = \frac{\frac{L}{2}}{\sqrt{a^2 + (\frac{L}{2})^2}}$$
- $$\phi_1 = \phi_2 = \phi$$
- $$B = \frac{\mu_0 I}{4\pi a}[\sin\phi_1 + \sin\phi_2]$$
- $$B = \frac{\mu_0 I}{4\pi a} 2 \times \frac{\frac{L}{2}}{\sqrt{a^2 + (\frac{L}{2})^2}}$$
- $$B = \frac{\mu_0 I L}{2\pi a\sqrt{4a^2 + L^2}}$$

Expression of magnetic field if point lies at the perpendicular bisector of conductor of finite length L at biot savart law

- $$B = \frac{\mu_0 I L}{2\pi a\sqrt{4a^2 + L^2}}$$

Arrangement of magnetic lines of field with the straight conductor at biot savart law

Concentric

Parameter represented by thumb in right hand thumb rule

Current

Parameter represented by fingers in right hand thumb rule

Magnetic field

Organ representing current in right hand thumb rule

Thumb

Organ representing magnetic field in right hand thumb rule

Fingers

Shape of graph of magnetic field with distance from the conductor

Hyperbola

Representation of graph of magnetic field with distance from the conductor

[Missing illustration]

Hyperbola