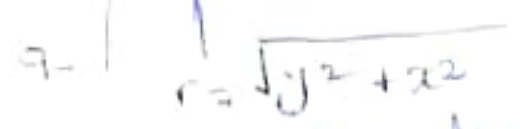

$$r = \sqrt{y^2 + x^2}$$

$$B = \frac{N_0 I}{4\pi} \int_{-a}^{a} \frac{dl \sin\theta}{r^2}$$

$$B = \frac{N_0 I}{4\pi} \int_{-a}^{a} \frac{dl\, x}{(y^2 + x^2)(y^2 + x^2)^{1/2}}$$

$$B = \frac{N_0 I}{4\pi} \int_{-a}^{a} \frac{dl\, x}{(y^2 + x^2)^{3/2}}$$

$$B = \frac{N_0 I x}{4\pi} \int_{-a}^{a} \frac{dl}{(y^2 + x^2)^{1/2}} \Bigg|_{-a}^{a}$$

$$B = \frac{N_0 I}{4\pi x} \left[\frac{2a}{(a^2 + x^2)^{1/2}} \right]$$

$$B = \frac{N_0 I}{2\pi x} \left[\frac{a}{(a^2 + x^2)^{1/2}} \right]$$

$(x^2 + a^2)^{1/2} \approx a$

$a >> x$

$$B = \frac{N_0 I}{2\pi x} \frac{a}{(a^2)^{1/2}}$$

$$B = \frac{N_0 I}{2\pi x}$$

$x = r$

$$B = \frac{N_0 I}{2\pi r}$$