3. Дано: $j = kr$, R

$B(r) - ?$

① $r < R$

$$\oint \vec{B}(r) d\vec{l} = \mu\mu_0 \int_0^r 2\pi k r^2 dr,$$

$$B(r) \cdot 2\pi r = 2\pi k \mu\mu_0 \int_0^r r^2 dr$$

$$B(r) \cdot 2\pi r = \frac{2\pi k \mu\mu_0 r^3}{3}$$

$$B(r) = \frac{k\mu\mu_0 r^2}{3}$$

② $r > R$

$$\oint \vec{B}(r) d\vec{l} = \mu\mu_0 \int_0^R 2\pi k r^2 dr,$$

$$B(r) \cdot 2\pi r = \frac{2\pi k \mu\mu_0 R^3}{3}$$

$$B(r) = \frac{k\mu\mu_0 R^3}{3r}$$

4. Дано: $B = br^a$

$j(r) - ?$

$$B = \mu\mu_0 \int 2\pi r' j dr'$$

$$\Rightarrow 2\pi b r^{a+1} = 2\mu\mu_0 \pi \int_0^r r' j(r') dr'$$

$$2(a+1)\pi b r^a = 2\mu\mu_0 \pi j(r) r$$

$$j(r) = \frac{r^{a-1}}{\mu\mu_0} (a+1) b$$