5. $dI = i\,dl = kR\sin\theta\,d\theta$ (1分)

$dB = \frac{\mu_0 dI}{2\pi R}$ (2分)

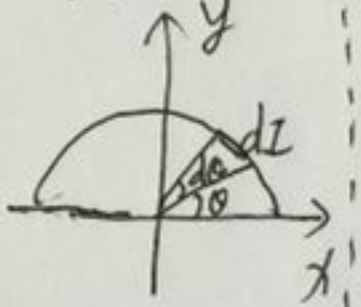
$dB_z = dB_y = 0$ (2分)

$dB_x = dB\sin\theta = \frac{\mu_0 k\sin^2\theta}{2\pi}d\theta$ (2分)

$B = \int dB_x = \int_0^{\pi} \frac{\mu_0 k\sin^2\theta}{2\pi}d\theta$

$= \frac{\mu_0 k}{4}$ (2分)

方向：x轴负方向 (1分)



6. $\oint \vec{H}\cdot d\vec{l} = \sum I_0$ (2分)

$r<R$ $B = \frac{\mu_0 I r}{2\pi R^2}$ (2分)

$r>R$ $B = \frac{\mu_0 I}{2\pi r}$ (2分)

$d\Phi = \vec{B}\cdot d\vec{S} = B\,dr$ (2分)

$\Phi = \int_0^R \frac{\mu_0 I}{2\pi R^2} r\,dr + \int_R^{2R} \frac{\mu I}{2\pi r}dr$

$= \frac{\mu_0 I}{4\pi} + \frac{\mu_0 I}{2\pi}\ln 2$ (2分)