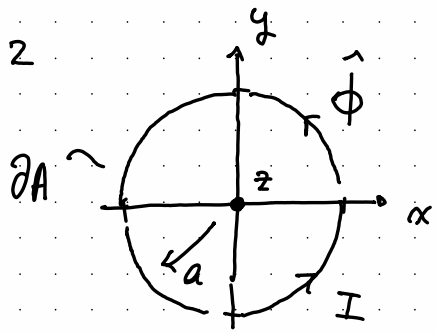
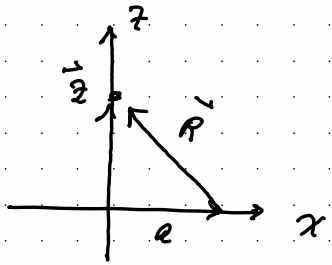
8.2





a)

$$B = \frac{\mu_0}{4\pi} \oint_{\partial A} \frac{(\vec{J}\,dV) \times \hat{R}}{R^2}$$

$$\vec{J}\,dV = I\,d\vec{\phi}$$

$$\vec{R} = \vec{z} - \vec{a}$$

$$R^2 = z^2 + a^2$$

$$B = \frac{\mu_0}{4\pi} \oint_{\partial A} \frac{I\,d\vec{\phi} \times (\vec{z} - \vec{a})}{(z^2 + a^2)^{3/2}}$$

$$= \frac{\mu_0}{4\pi} I \oint_{\partial A} \frac{d\phi\,(z\hat{a} + a\hat{z})}{(z^2 + a^2)^{3/2}}$$

$$= \frac{\mu_0}{4\pi} \frac{I}{(z^2+a^2)^{3/2}} \oint_0^{2\pi} z\hat{a} + a\hat{z}\; d\phi \qquad (z\hat{a} \to 0)$$

$$= \frac{\mu_0}{4\pi} \frac{I}{(z^2+a^2)^{3/2}}\, 2\pi a \hat{z} = \frac{\mu_0 I a}{2(z^2+a^2)^{3/2}}\, \hat{z}$$