10. (a) The current resulting from this non-uniform current density is

$$i = \int_{\text{cylinder}} J\, dA = \int_0^R J_0 \left(1 - \frac{r}{R}\right) 2\pi r dr = \frac{1}{3}\pi R^2 J_0 = \frac{1}{3} A J_0 \ .$$

(b) In this case,

$$i = \int_{\text{cylinder}} J\, dA = \frac{J_0}{R} \int_0^R r \cdot 2\pi r dr = \frac{2}{3}\pi R^2 J_0 = \frac{2}{3} A J_0 \ .$$

The result is different from that in part (a) because the current density in part (b) is lower near the center of the cylinder (where the area is smaller for the same radial interval) and higher outward, resulting in a higher average current density over the cross section and consequently a greater current than that in part (a).