A thin disk of radius $R$ and surface charge density $\sigma$ is placed at the center of a cube of dimension $a$.

(a) What is the flux through the surface of the box? (10 pts)

$$\varepsilon_0 \Phi = q_{\text{enc}}$$

$$\Phi = \frac{q_{\text{enc}}}{\varepsilon_0}$$

$$= \frac{\sigma A_{\text{disk}}}{\varepsilon_0}$$

$$= \frac{\sigma \pi R^2}{\varepsilon_0}$$

(b) If the disk is moved down a distance $a$ (i.e. to $z = -(a/2)$), what is the flux through the surface of the box? (10 pts)

$$\varepsilon_0 \Phi = q_{\text{enc}}$$

$$\Phi = \frac{q_{\text{enc}}}{\varepsilon_0}$$

$$\Phi = \frac{0}{\varepsilon_0}$$

$$= 0$$

disk has moved outside of box and is no longer enclosed.