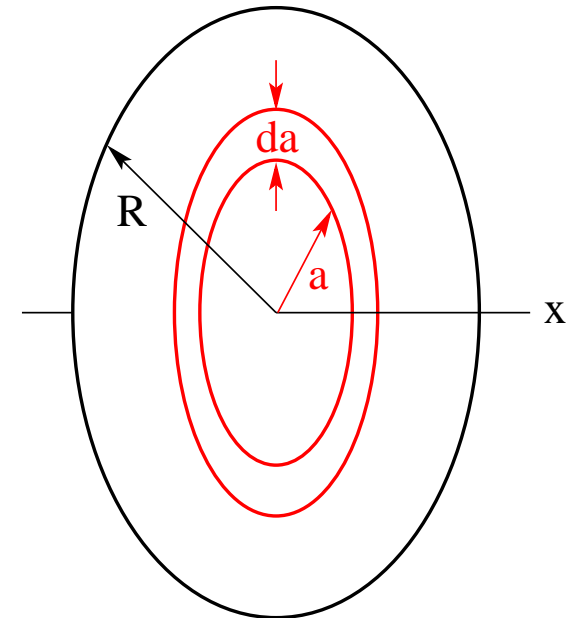


Electric Field of Charged Disk



- Charge per unit area: $\sigma = \frac{Q}{\pi R^2}$
- Area of ring: $dA = 2\pi a da$
- Charge on ring: $dq = 2\pi\sigma a da$



- $$dE_x = \frac{kxdq}{(x^2 + a^2)^{3/2}} = \frac{2\pi\sigma kxada}{(x^2 + a^2)^{3/2}}$$

- $$E_x = 2\pi\sigma kx \int_0^R \frac{ada}{(x^2 + a^2)^{3/2}} = 2\pi\sigma kx \left[\frac{-1}{\sqrt{x^2 + a^2}} \right]_0^R$$

- $$E_x = 2\pi\sigma k \left[1 - \frac{x}{\sqrt{x^2 + R^2}} \right] \text{ for } x > 0$$

- $x \ll R : E_x \simeq 2\pi\sigma k$

- Infinite sheet of charge produces uniform electric field perpendicular to plane.