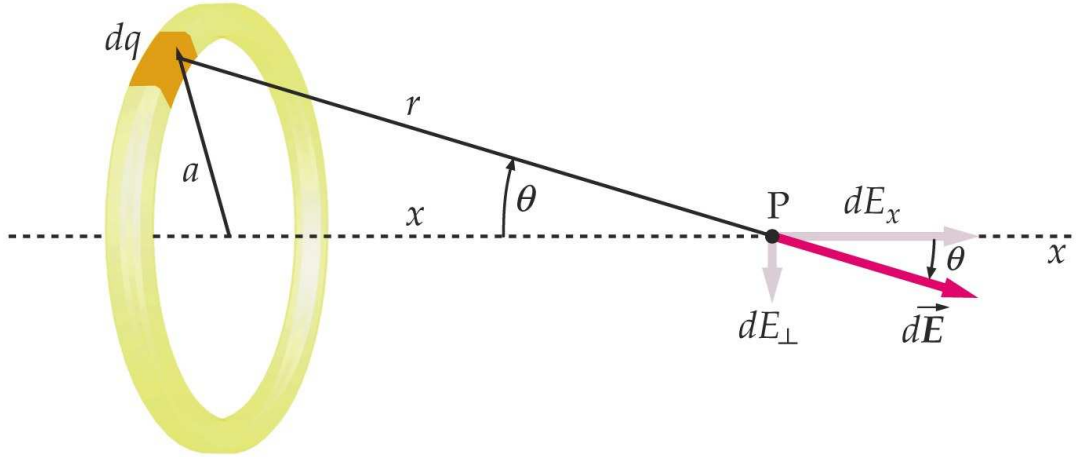
Electric Field of Charged Ring

- Total charge on ring: Q
- Charge per unit length: $\lambda = Q/2\pi a$
- Charge on arc: dq



- $dE = \dfrac{kdq}{r^2} = \dfrac{kdq}{x^2+a^2}$
- $dE_x = dE\cos\theta = dE\,\dfrac{x}{\sqrt{x^2+a^2}} = \dfrac{kxdq}{(x^2+a^2)^{3/2}}$
- $E_x = \dfrac{kx}{(x^2+a^2)^{3/2}}\displaystyle\int dq \;\Rightarrow\; E_x = \dfrac{kQx}{(x^2+a^2)^{3/2}}$
- $|x| \ll a:\; E_x \simeq \dfrac{kQx}{a^3}, \qquad x \gg a:\; E_x \simeq \dfrac{kQ}{x^2}$
- $(dE_x/dx)_{x=x_0} = 0 \;\Rightarrow\; x_0 = \pm a/\sqrt{2}$