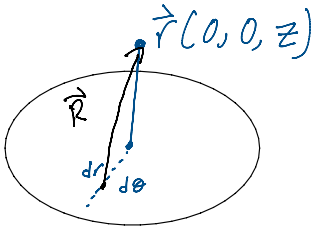
Circular Plate Math

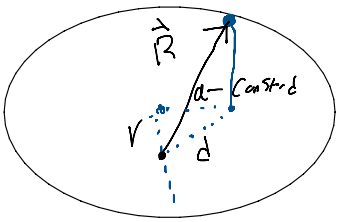
Thursday, January 18, 2024 4:16 PM

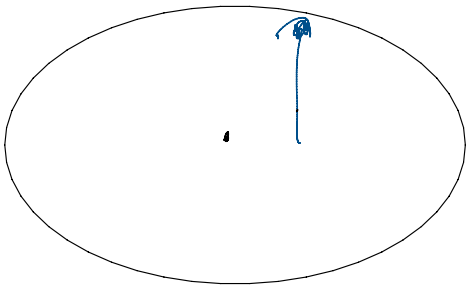


$$E(\vec{r}) = \frac{Q}{4\pi\varepsilon_0(\pi r^2)} \cdot \iint \frac{dr\,d\theta}{(z^2+r^2)^{3/2}} \cdot (z+r^2)$$

$$\vec{R} = (z^2 + r^2)^{1/2}$$

$$\int_0^{2\pi}\int_0^{radius} \frac{dr\,d\theta}{(r^2+a^2+z^2)^{3/2}} \cdot (r^2+a^2+z^2)^{1/2}$$





$$d = (r^2 + a^2)^{1/2}$$

$$\vec{R} = (d^2 + z^2)^{1/2}$$

$$\vec{R} = (r^2 + \underbrace{a^2 + z^2}_{\text{Constants}})^{1/2}$$

$$E(\text{at any Point}) = \frac{q}{(a^2+z^2)(a^2+q^2+z^2)}$$

q = disc radius