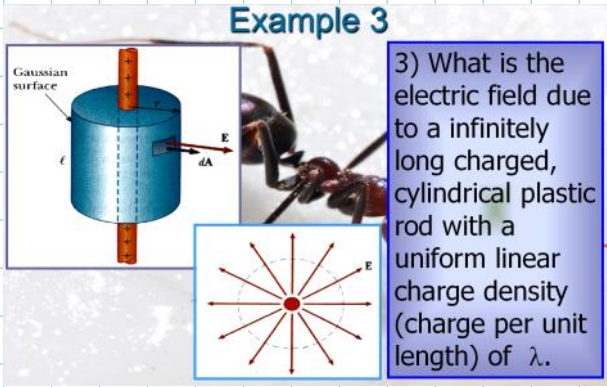


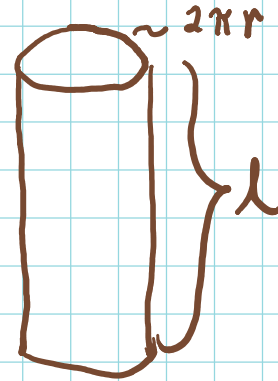
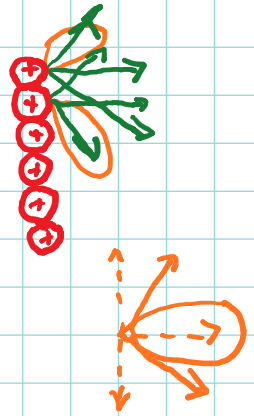
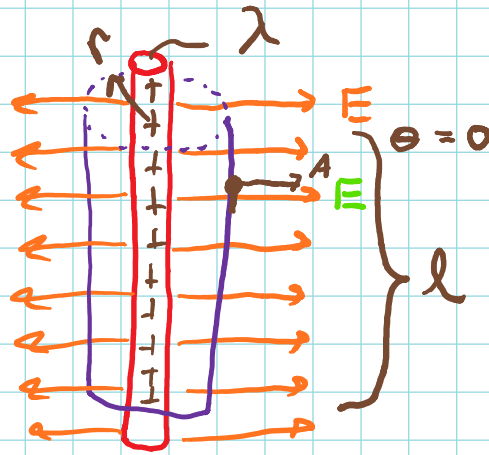
Example 3

Example 3

3) What is the electric field due to a infinitely long charged, cylindrical plastic rod with a uniform linear charge density (charge per unit length) of λ .



The diagram shows a blue cylindrical Gaussian surface of length ℓ and radius r surrounding a central orange rod. The rod has a uniform linear charge density λ . The electric field E is shown as arrows pointing radially outward from the rod. A small area element ΔA is indicated on the side of the Gaussian cylinder. Below, a cross-section of the rod shows radial electric field lines E emanating from a central point.



$$\Phi = \frac{q_{enc}}{\epsilon_0}$$

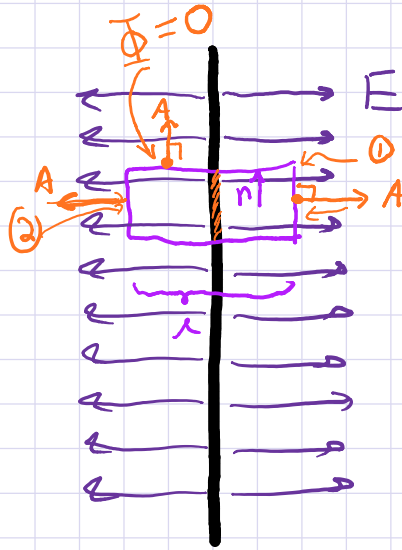
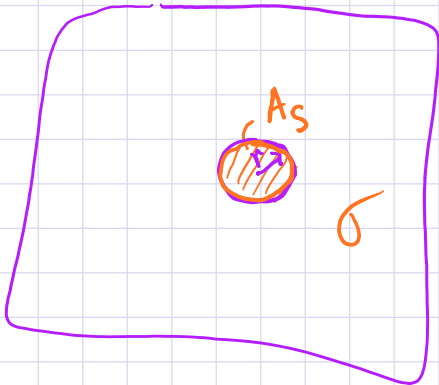
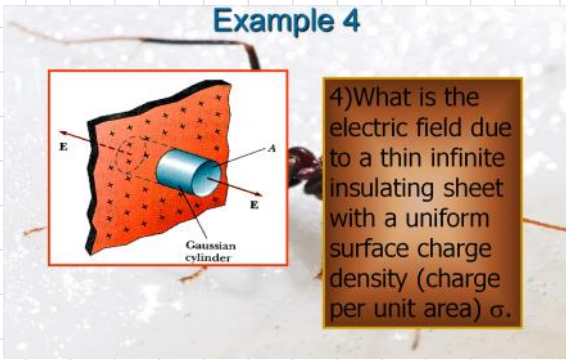
$$E A_s \cos \theta = \frac{q_{enc}}{\epsilon_0}$$

$$E (2\pi r \ell) = \frac{q_{enc}}{\epsilon_0}$$

$$E (2\pi r \ell) = \frac{\lambda \ell}{\epsilon_0}$$

$$E = \frac{\lambda}{2\pi \epsilon_0 r}$$

Example 4



$$\Phi = \frac{q_{enc}}{\epsilon_0}$$

$$E A_s \cos 0 = \frac{q_{enc}}{\epsilon_0}$$

$$E (2 A_s) = \frac{\sigma (A_s)}{\epsilon_0}$$

$$E = \frac{\sigma}{2 \epsilon_0}$$

$$q = \sigma A$$

