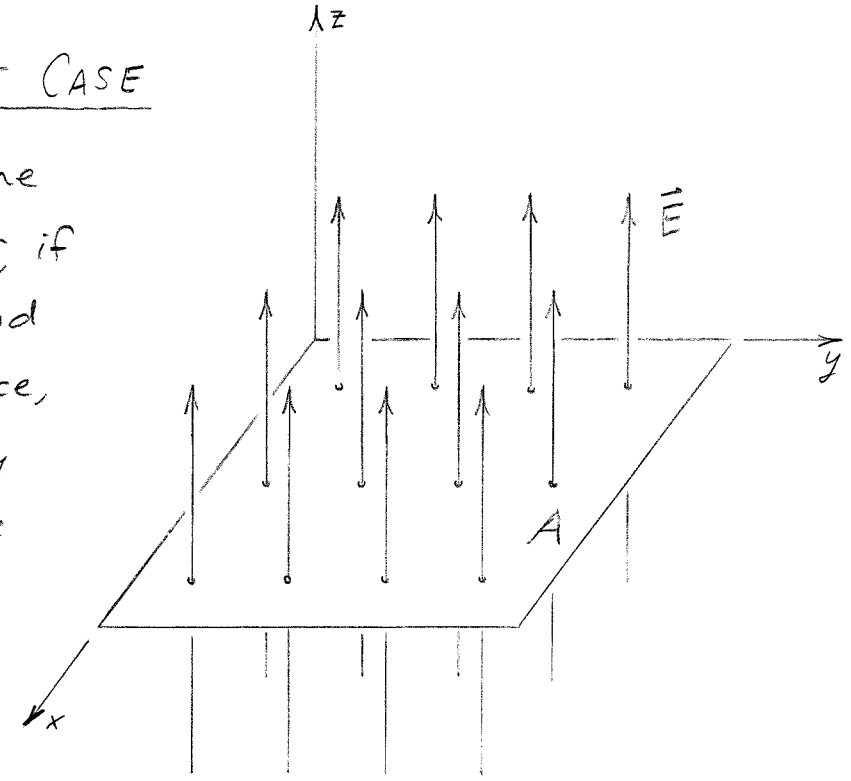
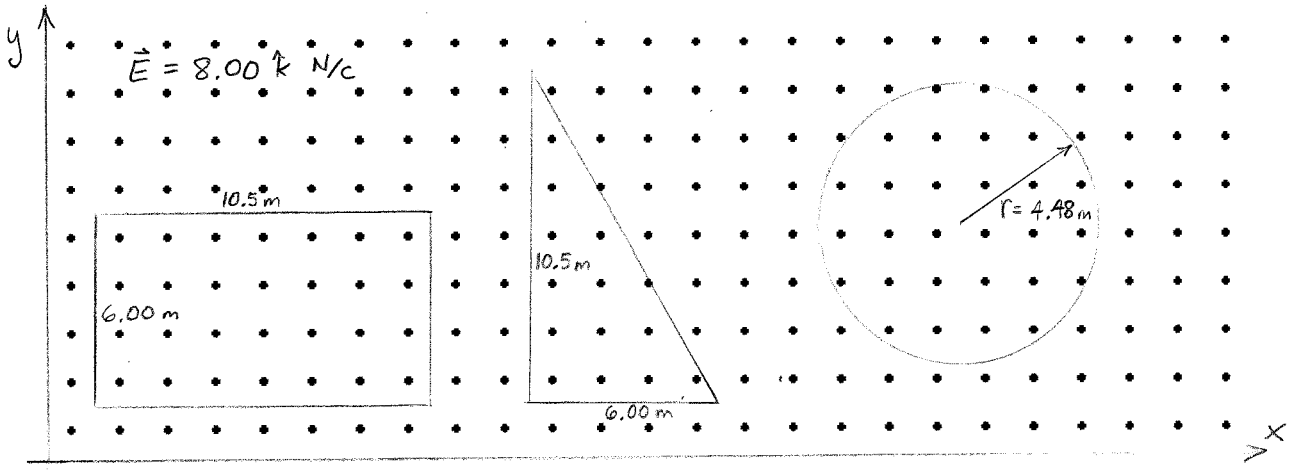
Electric Flux - Simplest Case

Electric flux is defined by the equation $\Phi = \int \vec{E} \cdot d\vec{A}$. However, if the electric field $\vec{E}$ is uniform and the area A is a planar surface, the electric flux can be found by the dot product $\Phi = \vec{E} \cdot \vec{A}$ where $\vec{A}$ is a vector with magnitude equal to area and direction that is normal to the surface.





1. $\vec{A}$ =

Φ =

number of lines =

2. $\vec{A}$ =

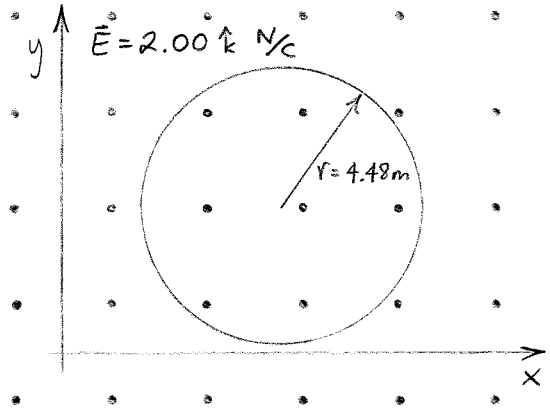
Φ =

number of lines =

3. $\vec{A}$ =

Φ =

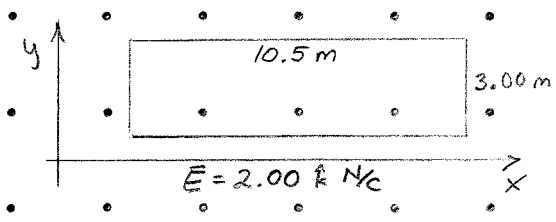
number of lines =



4. $\vec{A}$ =

Φ =

number of lines =



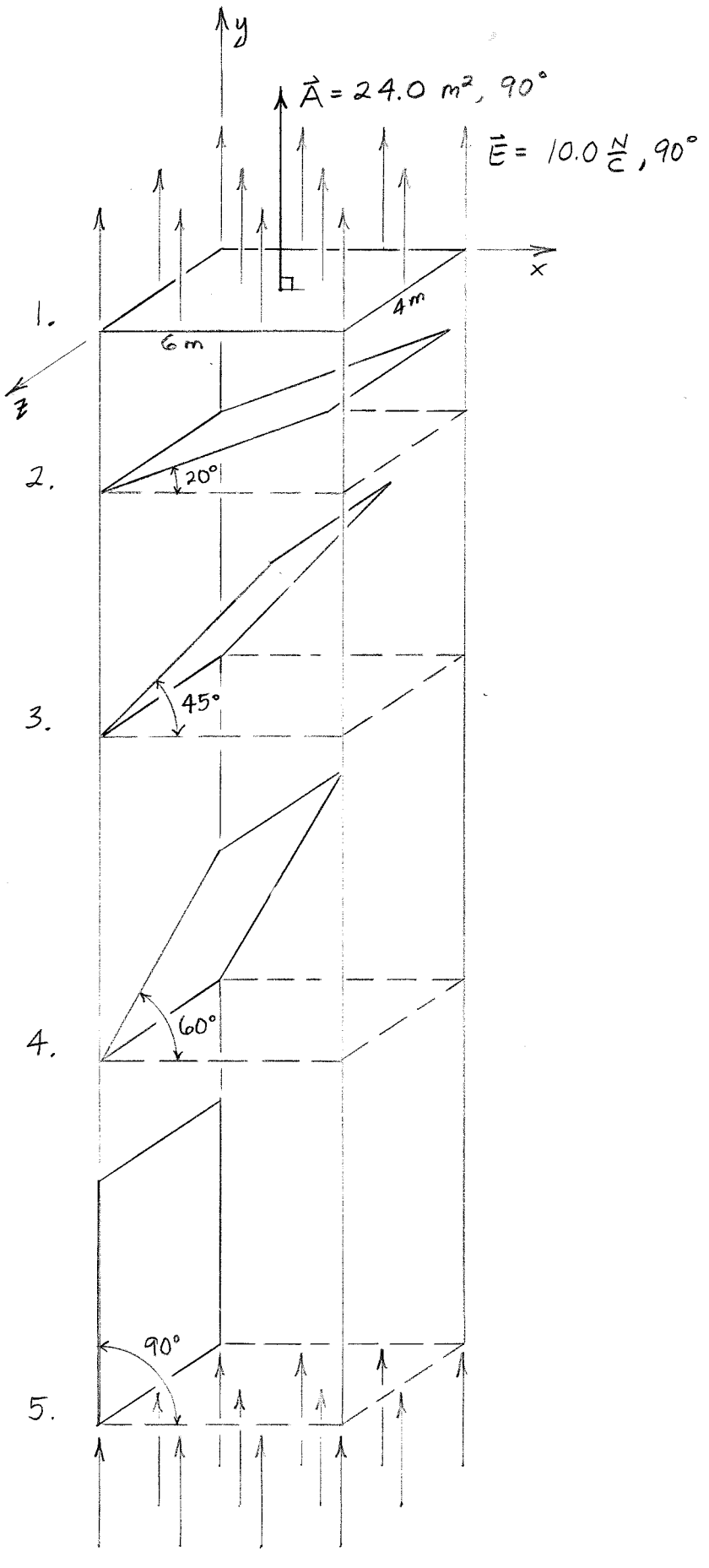
5. $\vec{A}$ =

Φ =

number of lines =

A Planar Surface at Various Angles in a Uniform Electric Field

The rectangular surface is rototed about the z-axis in an electric field that runs parallel to the y-axis Determine the area vector and then the electric flux for each case.



For example:

1. $\vec{A} = 24.0\ m^2, 90°$

$$\phi = \int \vec{E} \cdot d\vec{A} = \vec{E} \cdot \vec{A}$$

$$\phi = \left(10\ \frac{N}{C}\right)\left(24 m^2\right)\cos 0° = \boxed{240\ \frac{N\ m^2}{C}}$$