下面之公式可能对你有帮助

$$\nabla(\vec{A}\cdot\vec{B}) = (\vec{B}\cdot\nabla)\vec{A} + (\vec{A}\cdot\nabla)\vec{B} + \vec{B}\times(\nabla\times\vec{A}) + \vec{A}\times(\nabla\times\vec{B})$$

$$\nabla\cdot(f\vec{A}) = (\nabla f)\cdot\vec{A} + f(\nabla\cdot\vec{A})$$

$$\nabla\times(f\vec{A}) = \nabla f\times\vec{A} + f\nabla\times\vec{A}$$

$$\nabla\cdot(\vec{B}\times\vec{A}) = \vec{A}\cdot(\nabla\times\vec{B}) - \vec{B}\cdot(\nabla\times\vec{A})$$

1. A particle of mass m and charge q is dropped between a pair of electrically charged plane parallel plates as shown. L is the height of the plates and D is the separation between them. (20%)

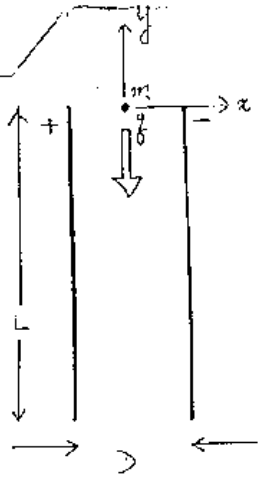


Fig. 1

(a) Obtain an expression for the path of the particle in the space between the plates. (Neglect the distortion of the electric field at the edges of the plates. Also, neglect air resistance).

(b) Let $m = 1$ gm , $q = 1\times10^{-9}$ coulomb, $D = 5$ cm , $L = 50$ cm , what is the potential difference V between the plates required to deflect the particle by 1 cm on leaving the plates ?

2. Shown in the drawing is a rectangular coil used to measure pulsed current $I(t)$ in the nearby wire. (20%)

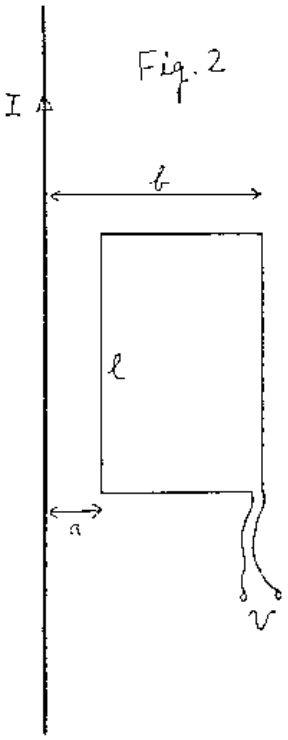


Fig. 2

(a) Find the magnetic flux through the rectangular coil.

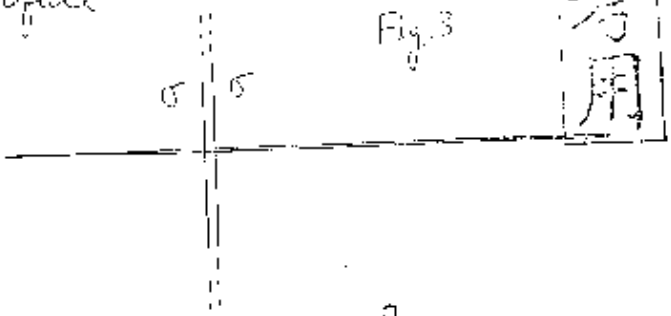
(b) What is the voltage V between the terminals of the coil?

3. A plane wave is incident into a hollow circular perfectly conducting cylinder. Show that the wave inside the hollow (20%)

perfectly conducting cylinder has a non-zero longitudinal component.

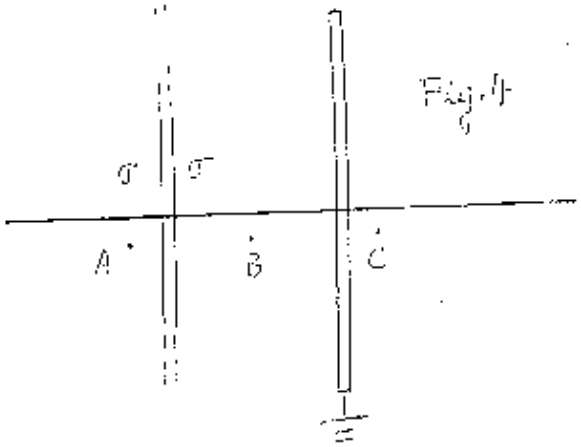
4. a) There is an uniformly charged very large conducting thin plate as shown in Fig 3. The surface charge density is σ coul/m^2. Describe quantitatively the electric field intensity $\vec{E}$ around the plate. 20%

Fig.3



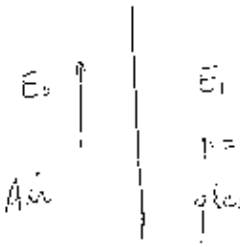
b) Now suppose another similar conducting thin plate (uncharged at the beginning) is brought near the first plate (see Fig 4). The second plate is then grounded. Find the field intensities at points A, B and C respectively.

Fig.4



5. As shown in Fig. 5, the left half space a) is filled with air and the right half space is filled with glass of index of refraction of 1.46. It is known that there is an uniform electric field existing in the left half space. What is the direction and magnitude of the electric field in the glass in relation with $\vec{E}_0$ in the air? 20%

Fig.5



b) A beam of monochromatic light is incident normally from the air into the glass. The geometry is similar to that in Fig. 5. What is the relationship of the two electric fields in the 2 media.