Answer on Question #44135, Physics, Electrodynamics

A charged particle of mass m is released from rest x along electric field e.j^ (vector) find angular momentum of particle from origin

Solution :

Distinguish three axes x,y,z they correspond to the three vectors $x: \bar{\imath}, y: \bar{\jmath}, z: \bar{k}$

Then particle has {x,0,0} coordinates, and field $\bar{E} = \{0, e, 0\}$

Impulse (momentum) from Newton's second law :

$$\frac{d\bar{p}}{dt} = \bar{F} = q\bar{E} = q * \bar{\jmath} * e$$

Obvious that $\bar{p} = qet * \bar{\jmath}$

From angular momentum (L)definition:

$\bar{L} = [\bar{r} * \bar{p}] = \left(x * \bar{\imath} + y * \bar{\jmath} + z * \bar{k}\right) * (qet * \bar{\jmath})$ (cross vector product)

But z always equal to zero, because there is no force in z direction.

$$\bar{L} = (x * \bar{\imath} + y * \bar{\jmath}) * (qet * \bar{\jmath}) = qet * (x * \bar{\imath} + y\bar{\jmath}) * \bar{\jmath} = qetx * \bar{k}$$

$\bar{\jmath} * \bar{\jmath} = 0$ (cross vector product)