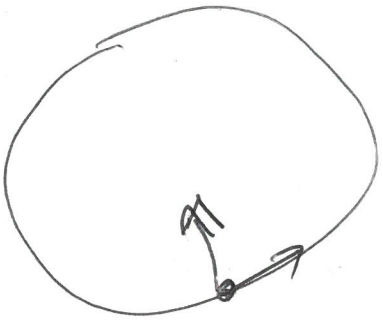
Ex 12.1

charged particle $(+q)$ with $\underline{v}$ $\perp$ $\underline{B}$

$$\underline{F} = q\,\underline{v} \times \underline{B} \quad \Rightarrow |\underline{F}| = qvB$$

Hence $$qvB = \frac{mv^2}{r}$$



$$rqB = mv = p \quad \text{(non-rel)}$$

$$\therefore r = \frac{p}{qB}$$

Also $$\frac{qB}{m} = \frac{v}{r} = \omega$$

so frequency of rotation

$$f = \frac{\omega}{2\pi} = \frac{qB}{2\pi m}$$

Ex 12.2

Square coil, side 20cm, in field.

$\underline{B} = (0.5\,\underline{i} + 0.2\,\underline{k})\,T$ – 5 turns.

(1) $\underline{\mu} = N I A \underline{k}$

$= 5 \times 2 \times 0.04 =$ ~~0.4 Am²~~.

$= 0.4\,\underline{k}\ Am^2$

(2) $\underline{\tau} = \underline{\mu} \times \underline{B} = \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ 0 & 0 & \mu_z \\ B_x & 0 & B_z \end{vmatrix}$

$= -\underline{j}(0 - \mu_z B_x) = \mu B_x \underline{j}$

$= 0.4 \times 0.5 =$ ~~0.2~~

$= 0.2\,\underline{j}\ Nm$

(3) $U = -\underline{\mu} \cdot \underline{B}$

$= -0.4\underline{k} \cdot (0.5\underline{i} + 0.2\underline{k})$

$= \underline{-0.08 \text{ J}}$