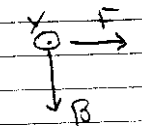
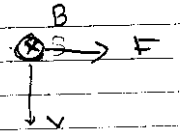
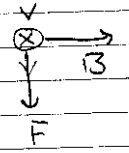
# HW 7

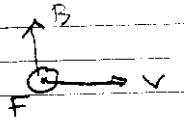
27-14 $\vec{F} = q\vec{v} \times \vec{B}$ use right hand rule:

magnitude $= qvB\sin\theta$

a) 

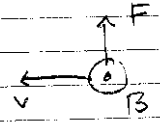

b) 


c) 


d) 

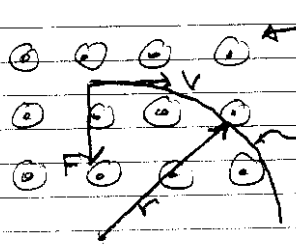

e) 


$F = 0$ for $\theta = 0, \pi$

f) 


27-19 Constant B

For a particle with positive charge q




notice for an electron charge is negative so field direction would be into plane, as on p. 693

(a) page 693: $r = \frac{mv}{qB} \Rightarrow v = \frac{rqB}{m}$

$\Rightarrow$ kinetic energy

$$\frac{1}{2}mv^2 = \frac{1}{2}m\left(\frac{rqB}{m}\right)^2$$

$$= \frac{1}{2}\frac{(qB)^2}{m}r^2$$

(b) $\vec{L} = \vec{r} \times \vec{p}$

$= m(\vec{r} \times \vec{v})$

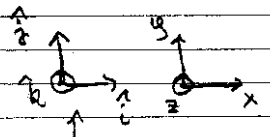
$\vec{r} \perp \vec{v}$ for circular motion so

$L = mrv$

$= mr\cdot\left(\frac{rqB}{m}\right)$

$= qBr^2$

27-27 proton: $q = e$




$\vec{B} = (0.45\hat{i} + 0.20\hat{j})\ T$

$\vec{E} = (3.0\hat{i} - 4.2\hat{j}) \times 10^3\ V/m$

$\vec{v} = (6.0\hat{i} + 3.0\hat{j} - 5.0\hat{k}) \times 10^3\ m/s$

$\vec{F} = e(\vec{E} + \vec{v} \times \vec{B})$

$= (1.6 \times 10^{-19}\ C) \cdot [(3.0\hat{i} - 4.2\hat{j}) \times 10^3\ \frac{V}{m}$ + cross product

$+ (6.0\hat{i} + 3.0\hat{j} - 5.0\hat{k}) \times (0.45\hat{i} + 0.20\hat{j}) \cdot T \cdot (10^3\ m/s)]$

use: $\hat{i} \times \hat{i} = 0$, $\hat{j} \times \hat{j} = 0$, $\hat{i} \times \hat{j} = \hat{k} = -\hat{j} \times \hat{i}$, $\hat{k} \times \hat{i} = \hat{j}$, $\hat{k} \times \hat{j} = -\hat{i}$

and both $\frac{CV}{m}$ and $C\ T\ \frac{m}{s} = N$

$\vec{F} = (1.6 \times 10^{-19}) \cdot 10^3 \cdot$

$\cdot [\hat{i}(3.0 + 1.0) + \hat{j}(-4.2 - 2.25)$

$+ \hat{k}(1.2 - 1.35)]\ N$

$= (6.4\hat{i} - 10.3\hat{j} - 0.24) \times 10^{-16}\ N$