Phys 3610, Fall 2009
Problem Set #6, Hint-o-licious Hints

1. *Taylor*, **9.8** Draw pictures and think about the directions of the cross products which give the centrifugal and Coriolis forces.

2. *Taylor*, **9.22** In the rotating frame the equation of motion for the charge takes the form (explain why!):

$$m\ddot{\mathbf{r}} = -k\frac{qQ}{r^2}\hat{\mathbf{r}} - q\mathbf{v}\times\mathbf{B} + 2m\dot{\mathbf{r}}\times\boldsymbol{\Omega} + m(\boldsymbol{\Omega}\times\mathbf{r})\times\boldsymbol{\Omega}$$

But here $\mathbf{v}$ is still the velocity in the inertial frame. We need to express it in terms of $\dot{\mathbf{r}}$, the velocity in the rotating frame. We can use

$$\mathbf{v} = \dot{\mathbf{r}} + \boldsymbol{\Omega}\times\mathbf{r}$$

Substitute this and choose $\boldsymbol{\Omega}$ so that the terms with $\dot{\mathbf{r}}$ cancel. This wont make the double cross products go away, but follow Taylor's hint that for small B they are small.

When you're done with with this the orbit in the rotating frame must be an ellipse, parabola or a hyperbola... why? How would this motion look if you go back to the inertial (non-rotating) frame?