**Physics 821: Problem Set 7**

**Due Thursday, November 19 at 11:59 P. M.**

Each problem is worth 10 points, unless otherwise specified.

1. GPS, Chapter 5, Problem 13
2. GPS, Chapter 5, Problem 14
3. GPS, Chapter 5, Problem 22
4. GPS, Chapter 5, Problem 29
5. An *asymmetric* top ($I_1 < I_2 < I_3$) executes torque free motion, with $2TI_2 = L^2$, where $T$ is the kinetic energy and $L^2$ is the square of the angular momentum. Assume that $\omega_2$ (the component of angular velocity along the body y axis) is initially zero. Integrate Euler's equations of motion to obtain the solution

$$\begin{aligned}
\omega_1(t) &= \omega_\infty \left[\frac{I_2(I_3 - I_2)}{I_1(I_3 - I_1)}\right]^{1/2} \mathrm{sech(t/\tau)} \\
\omega_2(t) &= \omega_\infty \mathrm{tanh(t/\tau)} \\
\omega_3(t) &= \omega_\infty \left[\frac{I_2(I_2 - I_1)}{I_3(I_3 - I_1)}\right]^{1/2} \mathrm{sech(t/\tau)},
\end{aligned}$$

where $\omega_\infty = 2T/L$ and $\tau^{-1} = \omega_\infty[(I_3 - I_2)(I_2 - I_1)/(I_3 I_1)]^{1/2}$