Physics 261: Problem Set #5

These tricks and treats are due at the end of the day on Friday, October 30.

1. BTM 2.2.10, 2.2.11 (p. 48)
2. Morin 3.57 (p. 80)
3. Morin 3.23 (p. 75) and 3.68 (p. 83)
4. Morin 5.34 (p. 180)
5. Morin 5.35 (p. 180)
6. Morin 5.39 (p. 181)
7. A mass m slides on a frictionless table, whirling at the end of string of an ever-shortening length $r(t) = r_0 - v_0 t$. Find the angular speed of the mass, $\omega(t) \equiv \dot{\theta}(t)$, given that at $t = 0$, $\omega(0) = \omega_0$. What is the tension in the string $T(t)$? Note: to get $\omega(t)$ you will need to solve the differential equation coming from $F_\theta = ma_\theta$. One method of attack: guess the ansatz $\omega_A(t) = B(1 - \beta t)^n$ and see if you can find a choice of the parameters B, β and n which satisfy the differential equation. You are also welcome to ask Mathematica, or to separate and integrate.
8. Mathematica notebook problem from Thursday session
9. (BONUS) Morin 5.51 (p. 184)