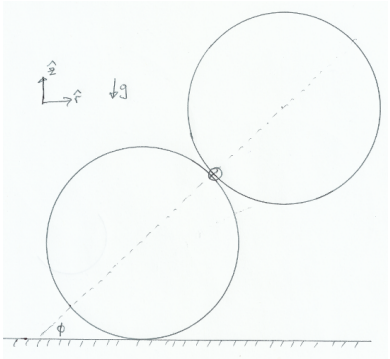
Physics 2301: Problem Set #3

These problems are due by the end of the day on Wednesday Jan 29 by upload to Carmen.

0. Remember to do the Essential Skill drill.
1. BTM 8.3.4 and 8.3.5 p. 217
2. Morin 9.40 (Sticking sticks) p. 424
3. Morin 9.47 (Original orientation) p. 425
4. Morin 9.48 (Seeing tails) p. 425
5. Morin 9.50 (Dipping low) p. 425
6. Morin 9.53 (Sliding lollipop) p. 427. Ignore part (a); just use the torque equation.
7. Morin 9.54 (Rolling wheel and axle) p. 427
8. Two uniform spheres each of mass m and radius R are fused together to form "hurricane balls". As drawn, the symmetry axis of the system makes a constant angle ϕ with the horizontal, and there is gravity $-g\hat{z}$. The center of mass of the system is stationary while the centers of the two spheres orbit the $\hat{z}$ axis with given angular rate Ω. The bottom sphere rolls without slipping. We seek ϕ in terms of Ω. What is the minimum possible Ω to make this work? What is the maximum possible ϕ?



9. (BONUS) Morin 9.36 (Quadrupole) p. 422