Homework for Week 8  
Due date: Wednesday, 26 October

1. A wheel—I suppose I really mean tire—can move on a surface at constant speed by slipping or by rolling without slipping. Show that if the wheel does not slip, a point on the wheel at the top moves instantaneously at twice the velocity of the center (the hub). There are several ways of proving this. One works in the ground frame of reference and begins by noting that the instantaneous velocity of the point of the wheel in contact with the ground is zero. An alternative works in the hub frame of reference.

2. In problem 8.9 below, if the apparent gravity in wheel B is the same as that on earth, what is the apparent gravity on wheel A? (How many of you have seen Stanley Kubrick’s *2001: A Space Odyssey* or read the book by Arthur C. Clarke? A rotating space station is very nice for a science-fiction movie, but do you think it is desirable in practice? What do you think NASA’s priorities should be? There’s no right or wrong answer, but I would like a short paragraph.)

Problems from Cutnell and Johnson: 8.2, 9 (see above), 12, 21, 24, 37, 40, 43, 44 (biochemists use centrifuges to separate sub-cellular organelles or molecules; they can also be useful in separating different isotopes of uranium for military purposes), 52, 54, 55
9.2, 7, 10, 11, 16, 17, 18, 20, 22, 23, 26, 27

There will be more problems from chapter 9 next week.