

**BE 159 Spring 2015**  
**Homework #5**

Due at the start of lecture March 5, 2015.

**Problem 1** (Adhesion and tension by looking).

While discussing the Maître, et al. paper, we talked about how careful thinking ahead of experimentation can open doors for new inquiries. A key component of that paper was the analysis of the force balances of doublet and triplet geometries of cells. In this problem, you will work through that exercise. Derive equation 1 of the Maître, et al. paper. *Hint:* It may be useful to recall the formulas for the surface area and volume of a spherical cap. Imagine we have a sphere of radius  $R$ . We then slice off a spherical cap. If we put the spherical cap on a table, its height is  $h$ . The surface area and volume of the cap are respectively

$$A_{\text{cap}} = 2\pi Rh, \tag{1}$$

$$V_{\text{cap}} = \frac{\pi h^2}{3}(3R - h). \tag{2}$$