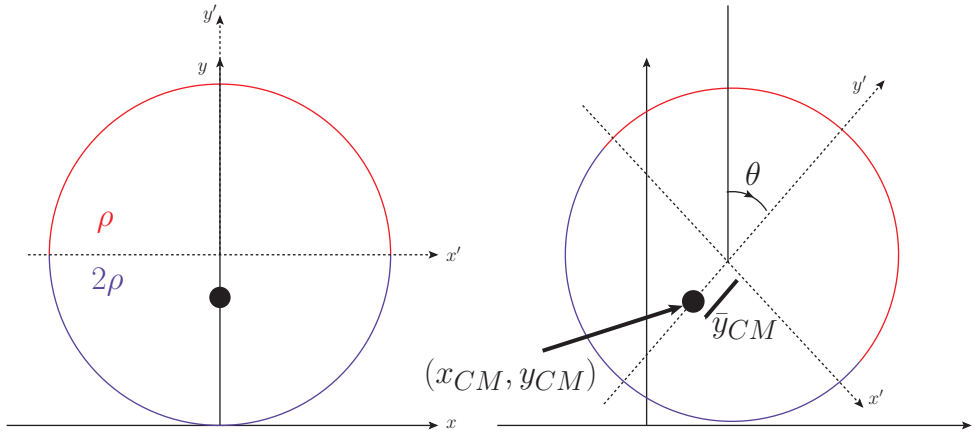
PHY 4936 HOME AND CLASS WORK – SET 7

(November 11, 2011)

Read Landau-Lifshitz p.96 up to p.101 (§31 and §32).

(29) Consider a thin disk composed of two homogeneous halves connected along a diameter of the disk. If one half has density ρ and the other has density 2ρ, find the expression for the Lagrangian when the disk rolls without slipping along a horizontal surface as shown in the figure (the rotation takes place in the plane of the disk). Due November 18 before class (10 points).



(30) A. Calculate $\vec{a} \times (\vec{b} \times \vec{c})$ as superposition of two of its vectors using

$$[\vec{a} \times (\vec{b} \times \vec{c})]_i = \epsilon_{ijk}\epsilon_{klm} a_j b_l c_m \ .$$

Due in class (3 points). B. Does the expression $\vec{a} \times \vec{b} \times \vec{c}$ make sense? Yes or No with reason. Due in class (1 point).

(31) The total, conserved energy of a system is given by

$$E \ = \ \frac{1}{2} M R^2 \dot{\theta}^2 \left[\frac{3}{2} - \frac{8}{9\pi} \cos\theta \right] + MgR \left[1 - \frac{4}{9\pi} \cos\theta \right] .$$

Consider the following energies:

$$\text{(A.) } E \ = \ MgR \, , \quad \text{(B.) } E \ = \ MgR \left(1 - \frac{4}{9\pi\sqrt{2}} \right) \ .$$

Are there turning points? If yes, give their θ values. Due November 21 before class (4 points).

Read Landau-Lifshitz p.105 up to p.111 (§33 and §35).