PC1141 AY08/09 Sem I

1. $T = 9600s$
   $r = 2.3 \times 10^7 m$

2. Normal force, $N = mg(3cos\theta - 2)$
   At θ_1 , $N = 0$
   $\Rightarrow cos\theta_1 = \frac{2}{3}$

   $f = \mu_s N$
   At θ_2 , ball slides.
   $cos\theta_2 > \frac{2}{3} \Rightarrow \theta_2 < \theta_1$
   Therefore, the ball slides before losing contact.

3. $f_{\oplus} \approx 3.4 \times 10^{-3}$

4. $\theta_{min} = tan^{-1}(\frac{1-\mu^2}{2\mu})$

5. (a) $f_{beat} = (\frac{2V}{v})f$

   (b) $f_{node} = (\frac{2V}{v})f$

   (c) The two frequencies from part (a) and part (b) are the same.

6. (a) $v_{min} = \sqrt{2gh}$

   (b) $d = \frac{v^2-2gh}{2g} sin2\theta + \frac{1}{g} cos\theta \sqrt{(v^2 - 2gh)(v^2 sin^2\theta + 2ghcos^2\theta)}$

   (c) $v_{min} = \sqrt{\frac{2(m+M)gh}{msin^2\theta + M}}$

7. (a) $T = 2\pi\sqrt{\frac{mL^2}{2\kappa}}$

   (b) $G = \frac{2\pi^2 Lr^2}{MT^2}\theta$

   (c) $T = 2\pi\sqrt{\frac{mL^2 r}{2\kappa(r - L\theta cos\theta)}}$

8. (a) $p(d) = -pg(d + h) + p_{atm}$

   (b) $p(r) = \frac{\rho\omega^2 r^2}{2}$

(c) $h(r) = \frac{\omega^2 r^2}{2g}$
The shape is parabolic.