Answers Exam 1 2009

1. a) $x_{car}(t) = \frac{1}{2} a_1 t^2 + v_1 t$

b) $v_w(t) = \frac{\beta t^4}{4} + v_1$

$x_w(t) = \frac{\beta t^5}{20} + v_1 t - L$

c) $\frac{\beta t^{*5}}{20} + v_1 t^* - L = \frac{1}{2} a_1 t^{*2} + v_1 t^*$

or $x_w(t^*) = x_{car}(t^*)$

2. a) $a_x(t) = c_1$; $a_y(t) = 3c_2 t^2$; $x(t) = \frac{c_1 t^2}{2} + L$

$y(t) = \frac{c_2 t^4}{4} + H$

b) $\tan\theta = \frac{\frac{c_2}{4} + H}{\frac{c_1}{2} + L}$

3. $x(t) = \frac{c_1 t^2}{2m} + \frac{c_2}{12m} \cos\theta \, t^4$; $y(t) = \frac{c_2 \sin\theta}{12m} t^4$

4. a) $P = mg \tan\theta$

b) $P = \frac{mg\sin\theta + \mu mg\cos\theta}{\cos\theta - \mu\sin\theta}$

c) $P = \frac{mg\sin\theta - \mu mg\cos\theta}{\mu\sin\theta + \cos\theta}$