Answers 1st Exam 2012

1. a) $x(t) = \frac{c_1 t^2}{2} + \frac{c_2 t^3}{3} + D$

b) $a(t) = c_1 + 2c_2 t$

c) $\vec{A} + \vec{B} + \vec{C} = (-B\sin\theta_1 + C\cos\theta_2)\vec{i} + (-A + B\cos\theta_1 + C\sin\theta_2)$

2. a) $x_a(t) = v_B \cos\theta \, t$

$y_a(t) = -\frac{1}{2} g t^2 + v_B \sin\theta \, t + S$

b) $v_B \cos\theta \, t^* = D$

$-\frac{1}{2} g t^{*2} + v_B \sin\theta \, t^* + S = H$

or $-\frac{1}{2} g \frac{D^2}{v_B^2 \cos^2\theta} + v_B \sin\theta \frac{D}{v_B \cos\theta} + S = H$

3. a) $-g T_{top} + \frac{c_1 T_{top}^2}{2} + v_R = 0$

b) $-\frac{g T_{grnd}^2}{2} + \frac{c_1}{6} T_{grnd}^3 + v_R T_{grnd} + H = 0$

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

$y_{car}(t) = \frac{1}{2} a_1 \sin\theta \, t^2 + v_1 \sin\theta \, t$

b) $x^r(t) = -\frac{c_2 t^4}{12} - v_w \cos\beta \, t + D$

$y^r(t) = \frac{c_1 t^3}{6} + v_w \sin\beta \, t + S$

c) $x_{car}(t^*) = x_r(t^*) = \frac{H}{\tan\theta}$

$y_{car}(t^*) = y_r(t^*) = H$