Phys 218 – Spring 2017
All Sections

Physics 218 – Exam III

[Learning objective(s)]

Short Problems:

A) i) $x_{\text{cm}} = 5.14$ m, $y_{\text{cm}} = 1.71$ m [45.1]

ii) $v_{x,\text{cm}} = \frac{m_3 v_3 - m_2 v_2}{m_1+m_2+m_3}$, $v_{y,\text{cm}} = \frac{m_1 v_1}{m_1+m_2+m_3}$ [45.2]

iii) $a_{x,\text{cm}} = \frac{-m_1 a_1}{m_1+m_2+m_3}$, $a_{y,\text{cm}} = \frac{m_3 v_3 - m_2 a_2}{m_1+m_2+m_3}$ [45.3]

B)

Y	N	[40.1]	[59.1]
Y	Y	[40.2]	[59.2]
N	N	[40.3]	[59.3]

C) i) No, it is different because the sum of the external forces on the thrown stone is not zero [48.1]

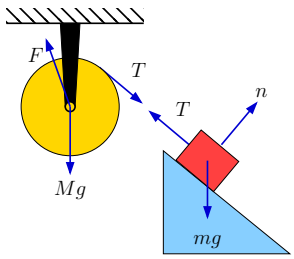
ii) Yes, it is the same because all stones are part of this system, and there are no external forces acting on them [48.2]

D) i) mvd [57.1]

ii) $mvd \sin\theta$ [57.2]

iii) $-7mvd$ [57.3]

Problem 1: (a) [23.1, 24.1, 26.1]



(b) $a = \frac{mg\sin\beta}{m+\frac{1}{2}M}$ [17.1, 21.1, 51.1, 54.1, 55.1]

(c) $F_y = \left(1 + \frac{m}{2m+M}\sin^2\beta\right) Mg$ [21.2, 22.1]

Problem 2: (a) $\tau = 2.82$ N m [54.2]

(b) $\omega = 12.7$ rad/s [35.1, 38.1, 40.4]

(c) $L = 0.44$ kg m^2/s [57.4]

(d) No, gravity acting on the centre of mass applies an external torque. [59.4]

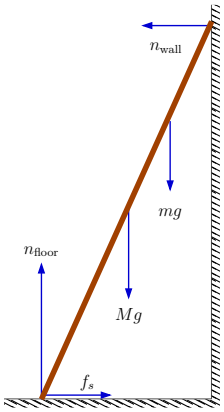
Problem 3: (a) $\vec{v}_{A,i} = (-0.91\hat{i} - 1.08\hat{j})$ m/s [1.1, 34.1]

(b) $\vec{p}_{\text{tot}} = (-3.15\hat{i} - 1.08\hat{j})$ kg m/s [46.1]

(c) $v_{A,f} = 3.15$ m/s, $v_{B,f} = 4.33$ m/s [46.2, 48.3]

(d) It is inelastic since $\Delta K = -3.7$ J [34.2, 50.1]

Problem 4: (a) [23.2, 26.2, 29.1]



(b) $n_{\text{wall}} = \frac{M+\frac{3}{2}m}{2\tan\theta}g$ [1.2, 54.3]

(c) $\mu_{\text{min}} = \frac{M+\frac{3}{2}m}{2\tan\theta(M+m)}$ [21.3, 21.4, 29.2]