Solution PHYS-205A-002 (Midterm Exam 02) Fall 2024

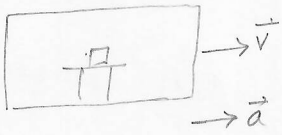
Problem 1

radially inward towards center.

Problem 2

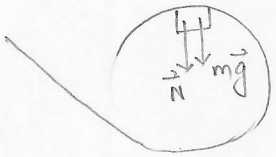
both have same acceleration, because tension force on the mass is the same in both case.

Problem 3



In the absence of friction, the cup will slide in the opposite direction to $\vec{v}$. This is the tendency of motion in the presence of friction. In the presence of friction the force of friction will be opposit to the tendency of motion. That is, along the direction of $\vec{v}$.

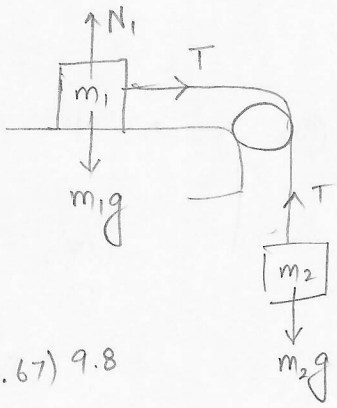
Problem 4



$$m\vec{a} = m\vec{g} + \vec{N}$$

$m\vec{g}$: gravity; $\vec{N}$: normal (downwards)

Problem 5



m_2: $m_2 a = m_2 g - T$

m_1: $m_1 a = T$

$(m_1 + m_2) a = m_2 g$

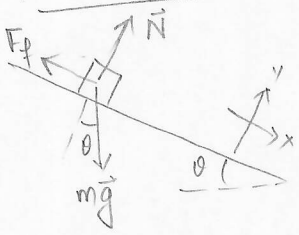
$\Rightarrow a = 0.67 g$

$T = m_1 a$

$= (1.0)(0.67)\, 9.8$

$= 6.6$ Newtons

Problem 6



$m\vec{a} = m\vec{g} + \vec{N} + \vec{F}_f$

x: $ma = mg\sin\theta - \mu_k N$

$ma = mg\sin\theta - \mu_k mg\cos\theta$

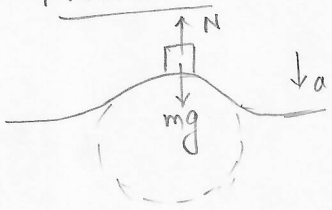
$a = g\sin\theta - \mu_k g\cos\theta$

$= 9.8\sin 30^\circ - (0.50)(9.8)\cos 30^\circ = 0.66 \frac{m}{s^2}$

y: $0 = -mg\cos\theta + N$

$N = mg\cos\theta$

Problem 7



$m\vec{a} = m\vec{g} + \vec{N}$

$m\frac{v^2}{R} = mg - N$

(a) set $N = 0$. $v = \sqrt{gR} = \sqrt{(9.8)(150)} = 38 \frac{m}{s}$

(b) $N = 0$