Physics 3A: Basic Physics I
Quiz #5b Solutions

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Discussion Section:____________________
Date:________________________________
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\[ f_{s,\text{max}} = \mu_s N \quad f_k = \mu_k N \quad F = m \frac{v^2}{r} \quad a_c = \frac{v^2}{r} \quad \vec{R} = -b \vec{v} \quad R = 1/2 D \rho A v^2 \]

\[ F_g = G \frac{m_1 m_2}{r^2} \quad F_e = k_m q_1 q_2 \frac{1}{r^2} \quad v = v_T (1 - e^{-\lambda^2/\tau}) \quad v_T = \frac{mg}{b} \quad \tau = \frac{m}{b} \]

1. (2 pts) You are sitting in the back of a flatbed truck. The truck is accelerating toward the north and you move with it, not sliding on the bed of the truck. What is the direction of the friction force applied on you by the bed of the truck?

a.) Since you are not moving relative to the truck, there is no friction force on you.

b.) Toward the north.
c.) Toward the south.
d.) It depends on the coefficient of friction.
e.) None of the above.

2. (2 pts) A baseball and a basketball, having the same mass are dropped through air from rest from the same height above the ground. Which ball strikes the ground first? (do not ignore air resistance).

a.) The basketball hits the ground first.
b.) They hit the ground at the same time.
c.) The baseball hits the ground first.
d.) not enough information to tell.

3. (6 pts) A merry-go-round makes one complete revolution in 7.55 s. If a 55.0 kg monkey sits on the horizontal floor of the merry-go-round 1.50 m from the center, find a.) the monkey's acceleration, b.) the horizontal force of friction that acts on the monkey assuming the monkey does not move relative to the floor, and c.) the smallest coefficient of static friction so the monkey does not slip? (use back of sheet as well, circle your final answer and show all work)

a.) want centripetal acceleration, so use: \[ a_c = \frac{v^2}{r} \], but need \( v \) first. Use: \( v = \frac{d}{t} \), where \( d = \) circumference of the circular motion:
\[ v = \frac{d}{t} = \frac{2 \pi r}{t} = \frac{2(3.14)(1.50)}{7.55} = 1.25 \text{ m/s} \], plug this into:

\[ a_c = \frac{v^2}{r} = \frac{(1.25)^2}{1.50} = 1.04 \text{ m/s}^2 \]

b.) the horizontal force of friction is the force that causes the centripetal acceleration, and thus must be:

\[ f_{ac} = ma_c = (55.0)(1.04) = 57.2 \text{ N} \]

c.) The smallest coefficient of static friction would be that which produces its maximum friction force equal to \( f \) from part b.). Also, know in this case that \( N \), the normal force pushing upward on the monkey is equal to the monkey's weight, so:

\[ f_{ac} = \mu_s N = \mu_s mg \text{ solve for } \mu \quad \mu = \frac{f_{ac}}{mg} = \frac{57.2}{(55.0)(9.80)} = 0.106 \]