Universal gravitation

Physics 211
Syracuse University, Physics 211 Spring 2015
Walter Freeman

March 1, 2016

Announcements

- I've been sick; sorry for late answers to emails
- HW5 due Friday
- I'm holding extended office hours on Thursday to help you: 1:30-5:30

Sample problems

The Atwood machine: two masses m_1 and m_2 are suspended from a rope around a light pulley. How do they accelerate?

Sample problems

The Atwood machine: two masses m_1 and m_2 are suspended from a rope around a light pulley. How do they accelerate?

What is the relation between the tensions forces on the two masses, and their accelerations?

- A: $T_1 = T_2$; $a_1 = a_2$
- B: $T_1 = -T_2$; $a_1 = -a_2$
- C: $T_1 = T_2$; $a_1 = -a_2$
- D: $T_1 = -T_2$; $a_1 = a_2$

The Greek waiter

What is the normal force exerted on the cup by the board as a function of L and ω while it's at the bottom?

- A: $F_N = mg + L\omega^2$
- B: $F_N = -mg + L\omega^2$
- C: $F_N = mg$
- D: $F_N = mg + F_{cent}$

The Greek waiter

What is the normal force exerted on the cup by the board as a function of L and ω while it's at the top?

- A: $F_N = mg + L\omega^2$
- B: $F_N = -mg + L\omega^2$
- C: $F_N = mg$
- D: $F_N = mg + F_{cent}$

The Greek waiter

Under what conditions will the cup fall?

- A: $F_N < 0$
- B: $\omega < mg$
- C: $L\omega^2 < F_{net}$
- D: $F_N < mg$

The Greek waiter

As you saw before, the cup will fall off the board if the person holding it makes sudden movements.

If the coefficient of static friction is μ_s and the length of the chains is L, what is the maximum angular acceleration α that can be achieved without the cup sliding off while it's at the bottom of its swing?

Clicker question: what does the force diagram for the cup look like while it's at the bottom?

- A: gravity downward, friction going upward, normal force going upward
- C: gravity downward, F_{net} going upward, normal force going upward, friction to the side
- C: normal force upward, gravity downward, friction going to the side
- D: gravity downward, F_{cent} going upward, friction going to the side

The conical pendulum

I swing a conical pendulum of length L with angular velocity ω. What angle does the string make with the vertical?

A block on a ramp

A block of mass m_1 rests on a ramp at angle θ; a weight of mass m_2 hangs over the side of the ramp. The coefficient of kinetic friction is μ_k.

Calculate its acceleration if it:

- ... slides down the ramp (m_2 is small)
- ... is pulled back up the ramp (m_2 is large)