Quizbit Week 6 Solutions

Monday, October 31, 2022 3:07 PM

Individual Quizbit 5

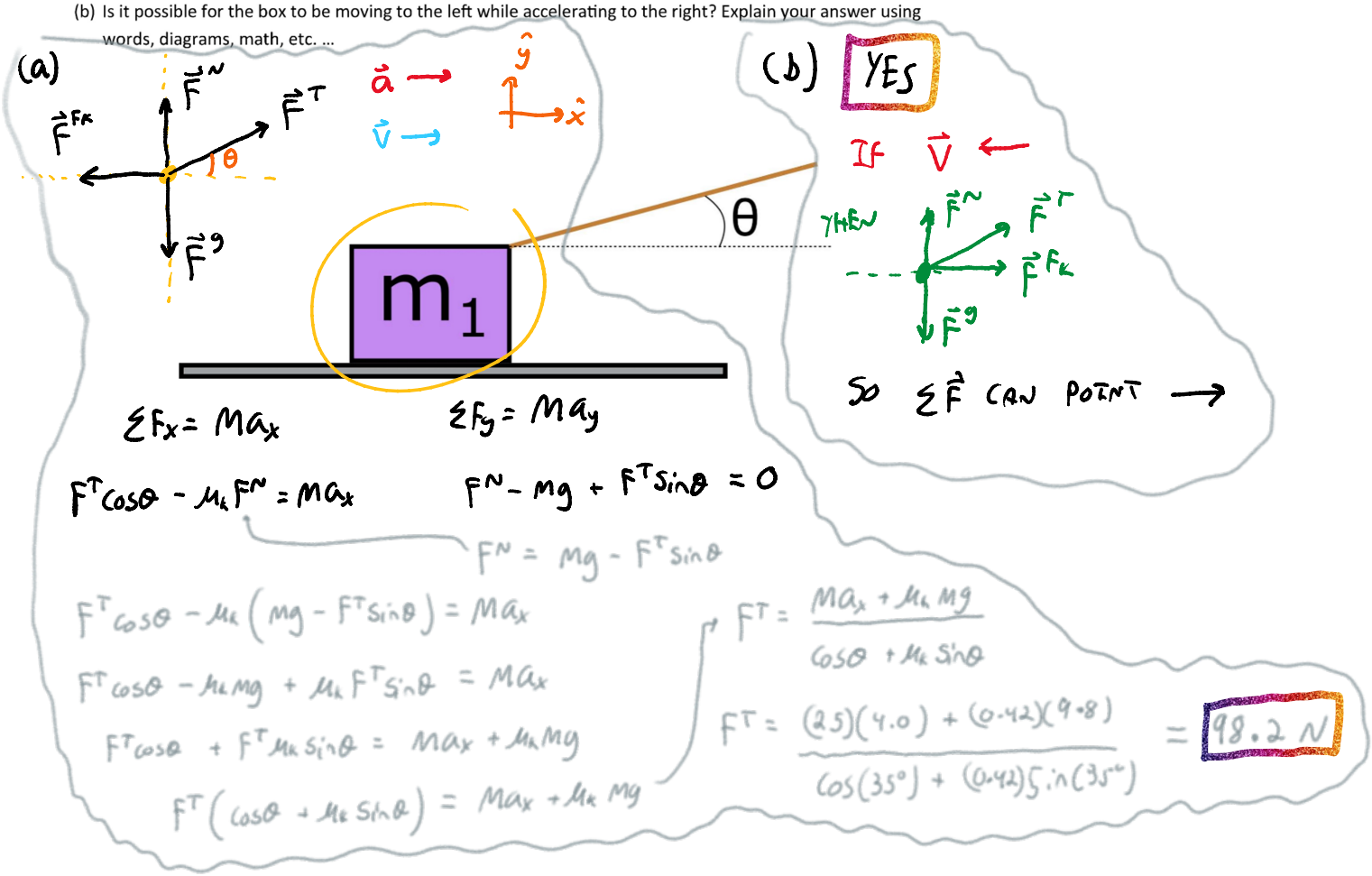
PH201, Fall 2022

You are encouraged to discuss these questions with others, but those conversations need to be only in words. Please do not write down steps for others, draw pictures, show math steps, or consult online resources. Any work shown here should be your own thoughts and not copied from any source. You will be graded on the clarity of how well you communicate your steps and reasoning, not on absolute correctness. Hand write your solutions (paper or tablet) and turn your work into Gradescope.

Problem Statement | A box, $\mathbf{m_1}$ = 25 kg, is being pulled by a rope that accelerates it to the right along the horizontal surface at 4.0 m/s^2. There is friction between the surface and the box: μ_s = 0.60 and μ_k = 0.42. The rope is at an angle θ = 35°.

(a) Calculate the tension in the rope.

(b) Is it possible for the box to be moving to the left while accelerating to the right? Explain your answer using words, diagrams, math, etc. ...



Group Quizbit 5

PH201, Fall 2022

You will be working with your group to create a single solution for these questions. You are encouraged to think about the questions beforehand, and discussing with your classmates is encouraged, but do not bring a solution to your group's working session. You are working to develop a shared solution, with the input and problem solving skills of all your group members. You will be graded on both the clarity of how well you communicate your steps and reasoning, and on absolute correctness.

Problem Statement | A delivery van is driving along a horizontal road. The truck could be moving at a constant speed, or accelerating in either the forwards or backwards direction. A box ($\mathbf{m_1}$) in the back of the van is up against the front end

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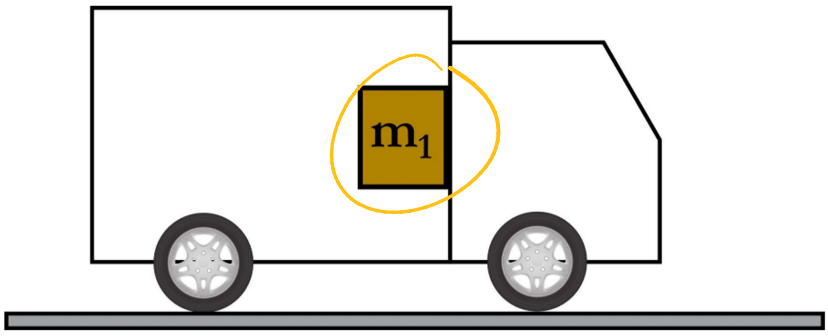
Problem Statement | A delivery van is driving along a horizontal road. The truck could be moving at a constant speed, or accelerating in either the forwards or backwards direction. A box (m_1) in the back of the van is up against the front end of the cargo area, not sliding on the wall. If the van was not accelerating, the box would slide downwards. There is friction between the box and the wall. For all parts of this question, analyze the situation as if you are standing on the Earth watching this van and box move in front of you.

(a) Describe with words, diagrams, etc... two scenarios of the van's motion that could result in the box not sliding relative to the wall, as shown in the figure.

(b) Sketch a FBD of the box system for one of the scenarios you described in part (a).

(c) What is the minimum acceleration of the box such that the box does not slide down the cargo area wall? The coefficient of static friction between the box and the wall is 0.750

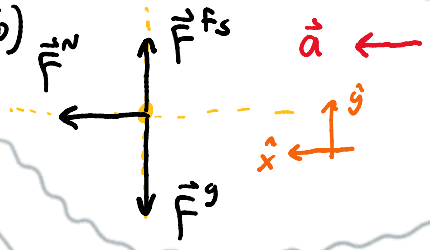


(a)

1. IF $\vec{v} \rightarrow$ AND $\vec{a} \leftarrow$ } TRUCK MOVING FORWARDS AND SLOWING DOWN

2. IF $\vec{v} \leftarrow$ AND $\vec{a} \leftarrow$ } TRUCK MOVING BACKWARDS AND SPEEDING-UP

(b)



(c) MIN $\vec{a}$ $\therefore$ $\vec{F}^{f_{s\max}}$

$\Sigma F_x = ma_x$ $\qquad$ $\Sigma F_y = ma_y$

$F^N = ma_x$ $\qquad$ $\mu_s F^N - mg = 0$

$F^N = \frac{mg}{\mu_s}$

$\frac{mg}{\mu_s} = ma_x$

$a_x = \frac{g}{\mu_s} = \frac{9.8}{.75} = 13.1\ m/s^2$