Physics 2414, Spring 2005
Group Exercise 1, Jan 27, 2005

Name 1: _____ OUID 1: _____

Name 2: _____ OUID 2: _____

Name 3: _____ OUID 3: _____

Name 4: _____ OUID 4: _____

Section Number: ____

Identifying Forces

Notation $\vec{F}_{12}$ - Force *on 1 by 2.*

Description

A truck is moving (with its engine shut off) on a level highway. The forces acting on the truck are:

(i) Weight force - $\vec{\mathbf{F}}_{TE} = 50$ kN - (gravitational) force acting on truck by earth.

(ii) Normal force - $\vec{\mathbf{F}}^V_{TS} = 50$ kN - vertical upward force on truck by surface of road. (This is a contact force and exists only when the truck is in contact with earth.)

(iii) Friction force - $\vec{\mathbf{F}}^H_{TS} = 15$ kN - horizontal force on truck by surface of road. (This is also a contact force.)

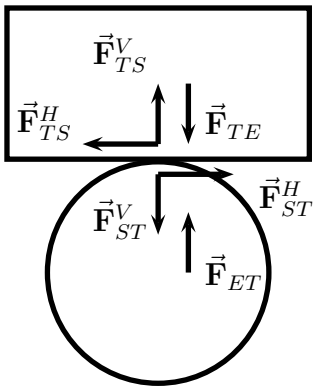


Fig: Schematic diagram showing the truck on earth.

Problems

1. *Truck:*

(a) Draw a free body diagram for the truck.

(b) Write the net force acting on the truck as the sum of all the forces acting on the truck.

$$\vec{\mathbf{F}}_{\text{net on truck}} =$$

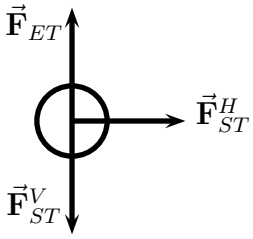
(c) What is the magnitude of the net force acting on the truck?

(d) What is the direction of the net force acting on the truck?

(e) If mass of the truck is 10,000 kg, what is the magnitude and direction of the acceleration of the truck? (Hint: Use $\vec{\mathbf{F}} = m\vec{\mathbf{a}}$.)

2. *Earth:*

(a) The free body diagram for the earth is



(b) What is the magnitude and direction of the net force acting on the earth?

$$\vec{\mathbf{F}}_{\text{net on earth}} =$$

(c) If mass of the earth is 6×10^{24} kg, what is the magnitude and direction of the acceleration of earth? (Hint: Use $\vec{\mathbf{F}} = m\vec{\mathbf{a}}$.)

3. *Action-reaction pairs:*

(a) What is the action-reaction pair of the force corresponding to the weight of the truck ($\vec{\mathbf{F}}_{TE}$)?

(b) What is the action-reaction pair of the force corresponding to the normal force acting on the truck ($\vec{\mathbf{F}}^{V}_{TS}$)?

(c) What is the action-reaction pair of the force corresponding to the friction force acting on the truck ($\vec{\mathbf{F}}^{H}_{TS}$)?