## Force and Motion Homework

Name: _____

Date: _____

Read Me:
- When justifying with a fact, write the fact first and underline it. Then connect the fact to the situation, ending the justification with your answer to the question.
- Write a fact in every justification. Don't refer to another problem where you wrote it.

1. Write the new fact into your Physics Facts booklet.

2. A downward moving elevator speeds up as it leaves the top floor. How does the upward force exerted by the cable on the elevator $\vec{F}_{C \text{ on } El}$ compare to the downward gravitational force that Earth exerts on the elevator $\vec{F}_{E \text{ on } El}$? Justify with a fact.
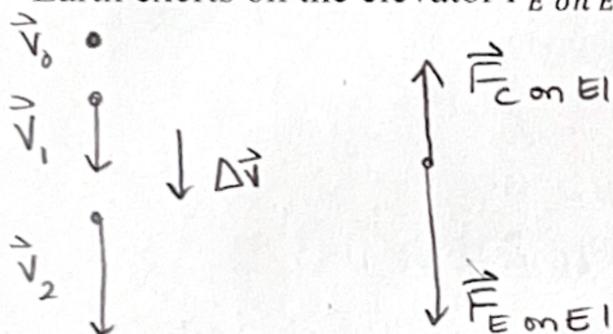
$\vec{V}_0$

$\vec{V}_1$

$\downarrow \Delta\vec{V}$

$\vec{V}_2$

$\uparrow \vec{F}_{C \text{ on } El}$

$\downarrow \vec{F}_{E \text{ on } El}$

The sum of the forces on a system and the change in velocity of a system always point in the same direction. From the motion diagram, the elevator's $\Delta\vec{V}$ points down, so the sum of the forces must point down too. This is only possible if $F_{E \text{ on } El} > F_{C \text{ on } El}$.

3. For # 44 on p.30,

a. Write a one or two sentence "story" about a real object that has this motion diagram.

A ball is dropped, bounces off the floor, and rebounds up, but not as high as the release point.

> Notice no arrows over the F symbols because we are talking about only magnitudes

b. Choose the object to be the system. What is the direction of the sum of the forces exerted on the system...

- when it is moving down? _down_
- when it is at its lowest point? _up_
- when it is moving up? _down_

4. You are at the grocery store, and you are watching a milk jug on the conveyer belt as it moves to the left at a constant speed toward the bagging area.

a. Draw a motion diagram that represents the milk jug's motion, and draw a force diagram for the milk jug.

$\vec{V}_2$ $\vec{V}_1$ $\vec{V}_0$

← ← ←

$\Delta\vec{V} = 0$

$\uparrow \vec{F}_{C \text{ on } J}$
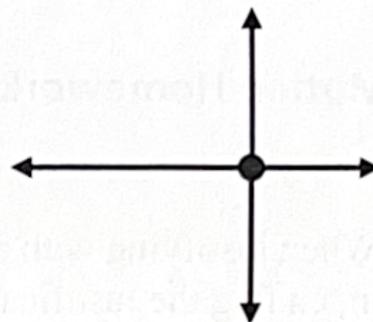
$\downarrow \vec{F}_{E \text{ on } J}$
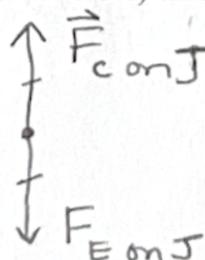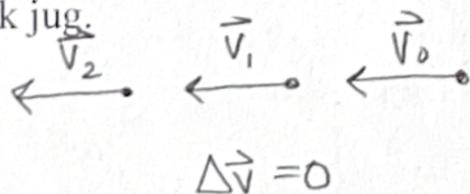
c = conveyer belt
J = Jug

b. What is the direction of the sum of the forces on the jug? Justify with a fact.

The sum of the forces on a system and the change in velocity of a system always point in the same direction. Since the jug has no change in velocity, it must also have a sum of the forces that equal zero. So there is no direction for the sum of the forces.

5. The force diagram for an airplane is given here:

a. Could the airplane be remaining at rest? Justify with a fact.

The sum of the forces on a system and the change in velocity of a system always point in the same direction. From the force diagram, the sum of the forces is to the left, so the change in velocity also points left. Therefore it cannot be remaining at rest.

b. In what direction is the airplane moving? No justification needed.

Cannot be determined.

c. What is happening to the airplane's speed? No justification needed.

It is changing, but we can't tell if it is increasing or decreasing.

d. Draw motions diagrams for two different motions of an airplane that are consistent with this force diagram. In one sentence, explain how you know that both motion diagrams are consistent with the force diagram.

$\Delta \vec{v}$ points left:

① $\vec{v}_2$ $\vec{v}_1$ $\vec{v}_0$

$\Delta \vec{v}$

② $\vec{v}_0$ $\vec{v}_1$ $\vec{v}_2$

$\Delta \vec{v}$
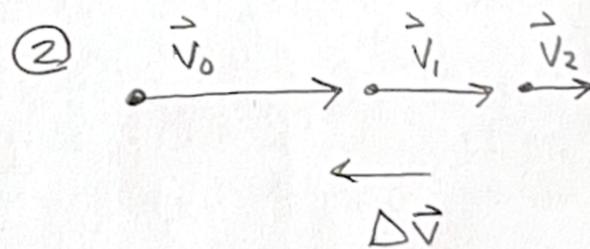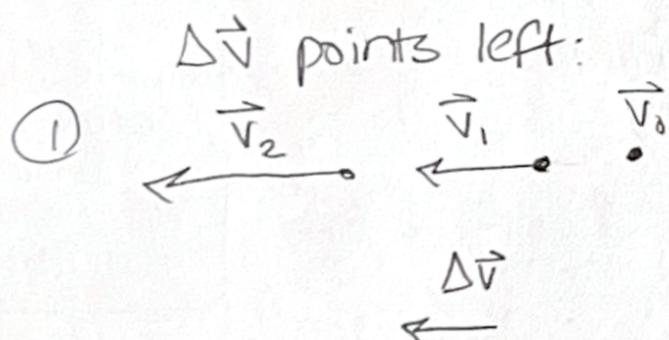
Both diagrams are consistent with the force diagram because their $\Delta \vec{v}$ arrows point in the same direction as the sum of the forces on the airplane.