

**Phy131 Second Homework Assignment**  
**Due Wednesday April 16**

*Figures for the questions can be found the the last page of the assignment*

**Question 1.**

The brakes on your car are capable of creating a deceleration of  $17 \text{ ft/s}^2$ . If you are going 85 mph and suddenly see a policeman, what is the minimum time that you can slow your car down to 65 mph? (note:  $60 \text{ mph} \approx 88 \text{ ft/sec}$ ). How far do you travel in slowing down from 85 mph to 65 mph?

**Question 2**

A stone is thrown vertically upward. On its way up it passes a point  $A$  with speed  $v$ . When it passes a point  $B$ , which is 3 meters higher than  $A$ , its speed is  $v/2$ . Calculate the speed  $v$ .

**Question 3**

Neil has a fast race car, and takes it out for a test run. He has an accelerometer in his car, and is able to measure his acceleration. His motion is in the  $+x$  direction, and his acceleration is given by the formula:

$$a_x = 4t \tag{1}$$

where  $t$  is in seconds and  $a_x$  is in  $m/s^2$ . At  $t = 0$  the car is at rest and at  $x = 0$ . Determine the following:

- a) the velocity of the car at time  $t = 3$  seconds.
- b) the position of the car at time  $t = 3$  seconds.
- c) the position of the car when the velocity is  $8 \text{ m/s}$ .

**Question 4**

An astronaut whose weight on earth is 700 Newtons travels to the moon. Find the weight and mass of the astronaut

- a) on the moon
- b) during the trip (while the space craft is "floating"). to the moon.

### Question 5

Two forces act on a 26 Kg mass. One force is due west with a magnitude of 12 Newtons, and the second force is due north with a magnitude of 5 Newtons. Find:

- the net force on the object.
- the position of the object at time  $t = 6$  seconds, if the object started from rest at the origin.

### Question 6

What strength of fishing line is needed to stop a 20 pound salmon swimming at 8 ft/sec in a distance of 6 inches? You can express your answer in units of pounds.

### Question 7

A force of magnitude  $F$  pulls a train of three cars to the right as shown in the figure on the last page. The first car has a mass of  $3M$ , the second car has a mass of  $2M$ , and the last car has a mass of  $M$ . A rope connects each of the cars. Assume there is no friction and that the ropes are massless. Find:

- The acceleration of the train. Express your answer in terms of  $F$  and  $M$ .
- The tension in each of the three ropes. Express your answer in terms of  $T$ .

### Question 8

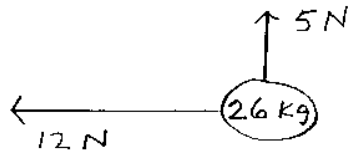
Jamie decides to do an experiment in an elevator. He suspends a block of weight 100 Newtons by tying two strings to the sides of the elevator (as shown in the figure on the last page).

- If the elevator is moving upwards with a **constant velocity** of 6 m/sec, find the tension ( $T_1$ ,  $T_2$ , and  $T_3$ ) in Newtons in each of the three strings.
- If the maximum tension that the strings can stand without breaking is 200 Newtons, what is the maximum acceleration upward that the elevator can have without any of the strings breaking?

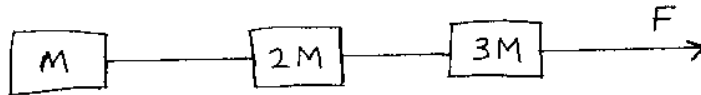
*See the next page for the figures*

Figures for Second Homework

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