

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Spring 2022

Problem Set #3

Problem Set Due: Thurs., Feb. 3, 2022

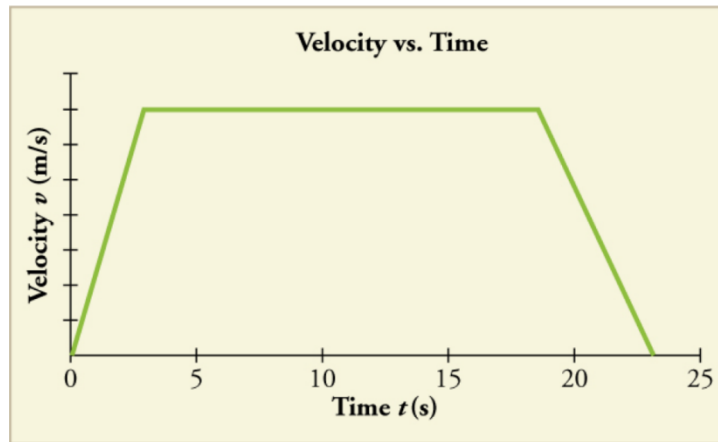
Read OpenStax: Chapter 3.1 & 3.4, Lecture Notes #2

There will be a Quiz #1 on Tuesday, Feb. 8

Show explicitly all your work for full credit.

1. A swan on a lake gets airborne by flapping its wings and running on top of the water.
 - (a) If the swan must reach a velocity of 6 m/s to take off and it accelerates from rest at an average rate of 0.35 m/s^2 , how far will it travel before becoming airborne?
 - (b) How long does this take?

2. A rescue helicopter is hovering over a person whose boat has sunk. One of the rescuers throws a life preserver straight down to the victim with an initial velocity of 1.40 m/s and observes that it takes 1.8 s to reach the water.
 - (a) List the knowns in this problem.
 - (b) How high above the water was the preserver released? (Ignore air resistance).



3. Consider the velocity vs. time graph of a person in an elevator shown above. Suppose the elevator is initially at rest. It then accelerates for 3 seconds, maintains that velocity for 15 seconds, then decelerates for 5 seconds until it stops. The acceleration for the entire trip is not constant so we cannot use the equations of motion for the entire trip (we could, however, use them in the three individual sections where acceleration is a constant). Sketch graphs of (a) position vs. time and (b) acceleration vs. time for this trip.

- | | |
|-----------------------------|-----------------------------------|
| 4. Expert TA: c4.1.1 | <i>conceptual problem—explain</i> |
| 5. Expert TA: 2.4.8 | show calculation and figure |
| 6. Expert TA: c4.3.5 | <i>conceptual problem—explain</i> |
| 7. Expert TA: 4.3.1 | show calculation and figure |
| 8. Expert TA: 4.3.6 | show calculation and figure |

On the homework that you turn in to class, numbers your problems #1 to #8 (the same way they are numbered in this handout).