**HOMEWORK 1**

**Solve any 5 of the following problems.**

Please remember to put your name, the date it is due, and the homework number at the top of your completed assignment. The following rules will be followed in working and turning in homework:
1. Work all problems using a sharp black pencil on one side of A4 paper. A prospective engineer should perform his work in a manner that would be professional. (Paper torn out of spiral notebooks will not be graded.)
2. Each problem should be numbered clearly. Separate problems to be worked on the same page with a heavy horizontal line across the page (use a ruler).
3. Your writing should be neat and legible. Your sketches should be neat and clear. Use a ruler if necessary.
4. Your solution should proceed step by step. Don't skip critical steps. Partial credits cannot be given if you don't show your steps in arriving at your answer. Always write the algebraic equation(s) used preceding the numerical solution.
5. Always include a sketch or free body diagram where necessary.
6. Box-in your final answer and make them stand out. Red pencil is for the instructor’s use only.
7. Use proper units.
8. Staple your work in the upper left-hand corner. Write your name, the date it is due, and the homework number on the top of the first page.
9. Turn in your homework at the beginning of class time.
10. You may discuss the problems with your classmates, but you are responsible for your own works.

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1. The position of a particle along a straight line is given by \( s = (0.3t^3 - 2.7t^2 + 4.5t) \) m, where \( t \) is in seconds. Determine its maximum acceleration and maximum velocity during the time interval \( 0 \leq t \leq 10 \) s.

2. The acceleration of a particle as it moves along a straight line is given by \( a = (2t - 1) \) m/s\(^2\), where \( t \) is in seconds. If \( s = 1 \) m and \( v = 2 \) m/s when \( t = 0 \), determine the particle’s velocity and position when \( t = 6 \) s. Also, determine the total distance the particle travels during this time period.
3. A car can have an acceleration and a deceleration of 5 m/s$^2$. If it starts from rest, and can have a maximum speed of 60 m/s, determine the shortest time it can travel a distance of 1200 m when it stops.

4. An elevator starts from rest at the first floor of a building. It can accelerate at 1.5 m/s$^2$ and then decelerate at 0.6 m/s$^2$. Determine the shortest time it takes to reach a floor 16 m above the ground. The elevator starts from rest and then stops. Draw the a-t, v-t, and s-t graphs for the motion.

5. A car travels along a straight road with the speed shown by the v–t graph. Determine the total distance the car travels until it stops at 72 s. Also plot the s–t and a–t graphs.

6. Starting from rest at s = 0, a tugboat travels in a straight line with an acceleration as shown by the a-s graph. Determine the boat's speed when s = 30, 100, and 200 m.
7. Determine the time needed for the load at \( B \) to attain speed of 8 m/s, starting from rest, if the cable is drawn into the motor with an acceleration of 0.2 m/s\(^2\).

8. The girl at \( C \) stands near the edge of the pier and pulls in the rope *horizontally* at constant speed of 1.8 m/s. Determine how fast the boat approaches the pier at the instant the rope length \( AB \) is 15 m.

\((h = 2.4 \text{ m})\)