Name _____ Date _____ Period _____

Unit 1 Worksheet 13 – Mixed Problems

Example Problems

I.   An airplane lands while moving at 85 m/s. The plane applies the brakes 1.5 s later and stops after traveling a total distance on the runway of 850 m. (a) How long did it take the plane to stop? (b) What was the acceleration of the plane?

II. An airplane lands with moving at a constant speed of v_1. The plane applies the brakes at t_1 and stops at time t_2. During the time of acceleration a the plane has traveled a distance on the runway of d_2. (a) What is the acceleration of the plane in terms of v_1 and t_2? (b) What is the total distance d in terms of v_1, t_1, & t_2?

Homework Problems

1) The velocity vs. time graph for an object moving along a straight path is shown to the right. (a) Find the average acceleration of the object during the time intervals 0 to 5.0 s, 5.0 s to 15 s, and 0 to 20 s. (b) Find the instantaneous acceleration at 2.0 s, 10 s, and 18 s.
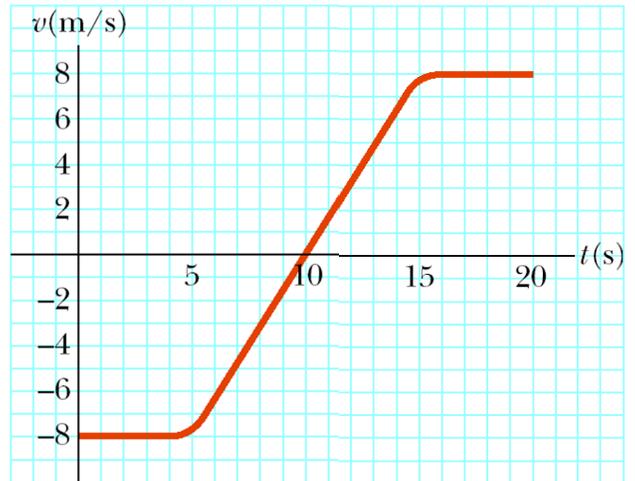
2) A truck on a straight road starts from rest and accelerates at 2.0 m/s² until it reaches a speed of 20 m/s. Then the truck travels for 20 s at constant speed until the brakes are applied, stopping the truck in a uniform manner in an additional 5.0 s. (a) How long is the truck in motion? (b) What is the average velocity of the truck during the motion described?

3) A record of travel along a straight path is as follows: 1. Start from rest with a constant acceleration of 2.77 m/s² for 15.0 s. 2. Maintain a constant velocity for the next 2.05 min. 3. Apply a constant negative acceleration of –9.47 m/s² for 4.39 s. (a) What was the total displacement for the trip? (b) What were the average speeds for legs 1, 2, and 3 of the trip, as well as for the complete trip?

4) A car starts from rest and travels for 5.0 s with a uniform acceleration of +1.5 m/s². The driver then applies the brakes, causing a uniform acceleration of –2.0 m/s². If the brakes are applied for 3.0 s, (a) how fast is the car going at the end of the braking period, and (b) how far has the car gone?

5) A car starts from rest and travels for t_1 seconds with a uniform acceleration a_1. The driver then applies the brakes, causing a uniform acceleration a_2. If the brakes are applied for t_2 seconds, (a) how fast is the car going just before the beginning of the braking period? (b) How far does the car go before the driver begins to brake? (c) Using the answers to parts (a) and (b) as the initial velocity and position for the motion of the car during braking, what total distance does the car travel? Answers are in terms of the variables a_1, a_2, t_1 and t_2.

6) A model rocket is launched straight upward with an initial speed of 50.0 m/s. It accelerates with a constant upward acceleration of 2.00 m/s² until its engines stop at an altitude of 150 m. (a) What is the maximum height reached by the rocket? (b) How long after lift-off does the rocket reach its maximum height? (c) How long is the rocket in the air?

7) An ice sled powered by a rocket engine starts from rest on a large frozen lake and accelerates at +40 ft/s². After some time t_1, the rocket engine is shut down and the sled moves with constant velocity v for a time t_2. If the total distance traveled by the sled is 17 500 ft and the total time is 90 s, find (a) the times t_1 and t_2 and (b) the velocity v. At the 17 500-ft mark, the sled begins to accelerate at –20 ft/s². (c) What is the final position of the sled when it comes to rest? (d) How long does it take to come to rest?