

Discussion 1: Week 2

Exercise 1: (a) If the displacement of a particle as a function of time is given by $x(t) = \alpha t^3 - \frac{\beta}{t}$, where α and β are constants, find the velocity and acceleration of the particle as functions of time.

(b) If the acceleration of a particle is given by $a(t) = A \sin(\omega t)$, and the particle is initially at rest at the origin, find the velocity and position of the particle as a function of time.

Exercise 2: Hayden and Matthew are riding around the neighborhood on their scooters. Hayden is at rest when Matthew passes him moving at a constant speed of v_1 . After time t_0 , Hayden decides to chase after Matthew, accelerating at a_2 . How much time must Hayden accelerate before he is side-by-side with Matthew?

Exercise 3: A tortoise and a hare are having a 1000-meter race. The tortoise runs the race at a constant speed of 2.30 cm/s. The hare moves at an average speed of 1.50 m/s for 10.0 minutes and then decides to take a nap. After waking up from the nap, the hare recognizes that the tortoise is about to cross the finish line and immediately accelerates from rest with a constant acceleration of 0.500 m/s^2 for the remaining distance of the race. If the tortoise wins by a hair (no pun intended), then what is the time in hours that the hare napped?