Name: A#:

1. A particle travels along the straight line shown below, beginning its journey at position P at time $t = 0$. For all $t \geq 0$, its displacement from P at time t is given by the formula $d(t) = t^3 - 12t^2 + 21t$, where positive values of displacement indicate positions to the *east* of P, and negative values indicate positions to the *west*. Time is measured in seconds and distance in metres..

$$P$$

West ◄─────────────●─────────────► East
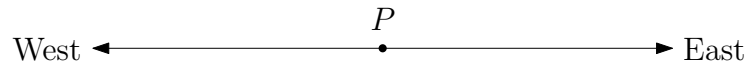
   (a) Where is the particle located after precisely 5 seconds?

   (b) Find the average velocity of the particle in the first 10 seconds of travel.

   (c) Use the limit definition to determine the instantaneous velocity $v(t)$ of the particle at time t.

   (d) What is the instantaneous velocity at time $t = 5$?

(e) At what times t is the particle stationary? (i.e. has velocity 0)

(f) At what times t is the particle moving eastward?

(g) At what times t is the particle located at point P?

(h) What is the total distance traveled in the first 10 seconds? (Be careful: Distance is different than displacement.)