Particle Motion Problems **Name:**

AP Calculus

1) A particle moves along the x-axis such that its position at any time t where $0 \le t \le 5$ is given by the function $x(t) = 2t^3 - 15t^2 + 36t - 22$

a) determine the velocity and acceleration functions
b) what is the particle's average velocity from t = 2 to t = 4
c) what is the particle's instantaneous velocity at t = 3
d) when is the particle at rest
e) when does the particle move to the right
f) what is the total distance traveled by the particle
g) what is the particle's maximum velocity
h) is the particle moving towards or away from the origin at t = 1
i) is the particle speeding up or slowing down at t = 1
j) what is the displacement of the particle over the interval

2) A particle starts at time t = 0 and moves on a number line so that its position at time t seconds is given by $x(t) = (t-2)^3(t-6)$. Show all work that leads to your answers or justify your answer in words.

a) Write the particle's velocity function
b) When does the particle stop?
c) Does the particle change direction at all its stops?
d) What is the particle's displacement from t = [1,6]?
e) What is the total distance the particle traveled from t = [1,6]
f) Set up an equation that could calculate a time when the particle's instantaneous velocity is equal to its average velocity over the interval [1,6]. Which theorem does this illustrate?