Rectilinear and Projectile Motion Practice

Solve the following problems involving projectile motion. Calculators may be required for some problems. Be sure to show all work required while rounding all solutions to 3 decimal places.

Note: Use $s(t) = -16t^2 + v_0t + s_0$ (feet) & $s(t) = -4.9t^2 + v_0t + s_0$ (meters) where appropriate for objects in free-falling motion.

- 1.) A particle is moving with its position defined by $s(t) = t^3 12t^2 + 36t$, where t is time measured in seconds and position in meters.
 - a.) What are the particle's velocity and acceleration formulas?

- b.) When is the particle at rest? Moving forwards? Moving Backwards?
- c.) What is the displacement of the particle in the first eight seconds?
- d.) What is the total distance traveled by the particle after the first eight seconds?
- e.) When is the particle's acceleration positive? negative?
- f.) When is the particle speeding up? slowing down?

- 2.) A silver dollar is dropped from a building that is 1,362 feet in height. Time is represented in seconds
 - a.) What are the silver's dollar's height, velocity, and acceleration functions?

b.) When does the silver dollar hit the ground and what is its impact velocity?

c.) How far does the silver dollar travel between t = 1 second and t = 2 seconds?

3.) The displacement in feet of a body of water moving along a line at any time t in seconds is given by

$$s(t) = t^3 - 6t^2 + 9t + 5$$

a.) What are the velocity and acceleration functions?

b.) Find the total distance traveled from t = 0 seconds to t = 4 seconds.

c.) What is the velocity of the body when the position is 8 feet?

4.)	A projectile is launched from the top of a 117.6 meter building. Its initial velocity was	
	a.)	What are the projectile's height, velocity, and acceleration functions?
	b.)	When is the projectile at it's maximum height and what is the maximum height?
	c.)	When does the projectile hit the ground and what is its impact velocity?
5.)	An obje	ect has its position defined in feet by $s(t)=t^3-9t^2+24t+20$, where t is time in seconds. What are the velocity and acceleration functions?
	b.)	What is the total distance traveled by the object during the first eight seconds?
	c.)	What is the displacement of the object after the first eight seconds?

6.)	A projectile is launched upward from a slingshot from a height of 455 feet with an initial velocity of $102 \frac{\text{ft}}{\text{sec}}$		
	a.)	What are projectile's height, velocity, and acceleration functions?	
	b.)	What is the position of the projectile when the velocity is 22 feet per second?	
	c.)	When will the projectile hit the ground? What is its impact velocity?	
	d.)	When will the projectile reach its maximum height? What is its maximum height?	
	e.)	What is the velocity of the bag when it is 250 feet above the ground?	