Name: ———————————————————————————————   ————————— / 25

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. **[8 points]** A small bug is crawling along a branch of a tree. The bug's distance, in millimeters, from the trunk after t seconds is given by the function

$$s(t) = 8t - 3t^2 + \frac{1}{3}t^3.$$

   a. What is the velocity of the bug at time t?

   b. When is the bug at rest?

   c. What is the acceleration of the bug when it's at rest?

   d. At time $t = 3$, is the bug moving toward the trunk or away from the trunk? Justify your answer.

2. **[2 points]** Let P denote the population of an invasive species of fish that is growing over time, t. Suppose the population P grows at a rate proportional its size. What can you say about the function $P(t)$?

3. **[6 points]** The edge of a cube was found to be 5 meters with a possible error in measurement of 0.1 meter. Use differentials to estimate the maximum possible error in computing the surface area of the cube. Include units with your answer.

4. **[9 points]** The altitude (height, h) of a triangle is increasing at at rate of 2 cm/sec while the area of the triangle is decreasing at a rate of 1 cm^2/sec. At what rate is the base, b, of the triangle changing with the altitude is 10 cm and the area is 100 cm^2? Include units with your answer.