Class prep quiz on section 3.7, Stewart's Calculus (8th ed.)

1. For which of the following lists of three quantities can the list be represented as f, f', f'', respectively, of a single function f?
   (a) Velocity, position, acceleration
   (b) Position, acceleration, velocity
   (c) Acceleration, position, velocity
   (d) Position, velocity, acceleration

2. Which of the following quantities is **NOT** naturally represented as the derviative of some function?
   (a) The average rate of growth of a population over a period of time
   (b) The current coming into a region of space
   (c) The marginal cost of producing x units of some good
   (d) The acceleration of some object in motion

3. Consider the following problem:

   > Suppose $f(t) = Ae^{kt}$ is the number of bacteria in a particular population at time t hours after an experiment begins. After 1 hour, there are 25,000 bacteria, and after 2 hours, the population is increasing at a rate of 1,500 bacteria per hour. How many bacteria will there be after 7 hours?

   Which of the following is a **CORRECT** mathematical translation of this problem?
   (a) Given $f(1) = 25,000$ and $f(2) = 1,500$, find the value of $f(7)$.
   (b) Given $A = 25,000$ and $f'(2) = 1,500$, find the value of $f(7)$.
   (c) Given $f(1) = 25,000$ and $f'(2) = 1,500$, solve $f(t) = 7$ for t.
   (d) None of the above.

4. Suppose $P(t)$ represents the proportion of some population that has had an infectious disease, and suppose we know that

$$\frac{dP}{dt} = .07P(t)(1 - P(t)).$$

Which of the following **MUST** be true?

(a) If $P(t)$ is close to 0 at time t, then $P(t)$ will decrease, and if $P(t)$ is close to 1 at time t, then $P(t)$ will increase.

(b) If $0 < P(t) < 1$ at some time t, $P(t)$ will decrease.

(c) If $0 < P(t) < 1$ at some time t, $P(t)$ will increase.

(d) None of the above.