Math 172 **Quiz 6 Solutions** **Spring 2006**

1. A biologist studied the growth of a rabbit population in a field. She let $f(t)$ represent the number of rabbits t weeks from the start of her research. Suppose that $f'(9) = 8$. Which of the following sentences must be true?

   The correct answer is: (b) Nine weeks after the start of her research, the rabbit population was increasing by eight rabbits per week.

2. On the graph of $y = 4x^2 - 300$, what is the slope of the curve at $x = 10$?

   We note that $y' = 8x$ and let $x = 10$ to obtain that the correct answer is: (a) 80

3. If $y = e^{3x}$, then

   $$\frac{dy}{dx} = 3e^{3x}$$

4. If $P(t) = t^2 e^{-t}$, then

   $$P'(t) = 2te^{-t} - t^2 e^{-t}$$

5. Suppose that 100 rabbits were released on an island that had no previous rabbits. Let R denote the rabbit population t months after they were released. The rabbit population grows at a rate which is proportional to the population size itself, where the constant of proportionality is 0.05 (i.e. a continuous growth rate of 5% per month). Write down a differential equation with initial condition to model the growth of this rabbit population.

   $$\frac{dR}{dt} = 0.05R \quad \text{and} \quad R(0) = 100$$