Math 172 **Quiz 6 Solutions** **Spring 2007**

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: (c) Nine weeks after the start of her research, the rabbit population was increasing by eight rabbits per week.

2. A model for the population of a town predicts the population t years from now to be given by $P(t) = 800e^{-0.04t}$.

   (a) What population does this model predict for this town 30 years from now?

   $P(30) \approx 241.0$ people

   (b) How quickly in people per year is the population predicted to be changing 30 years from now?

   $P'(30) \approx -9.6$ people per year

3. 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: 80

4. Find derivatives of the following functions. Use Leibniz notation for the derivatives.

   (a) If $y = \sqrt{2x^4 - 5x^2 + 4}$, then

   $$\frac{dy}{dx} = \frac{1}{2}\left(2x^4 - 5x^2 + 4\right)^{-1/2}\left(8x^3 - 10x\right)$$

   (b) If $h = \dfrac{5}{t^2}$, then

   $$\frac{dh}{dt} = \frac{-10}{t^3}$$

   (c) If $P = 3re^{-r}$, then

   $$\frac{dP}{dr} = 3e^{-r} - 3re^{-r}$$