

Exam 2 - Version A

Math 220 Sections 03xx

October 26, 2006

Instructions: Put one problem on each answer sheet (use the back if necessary), and put your name, your TA's name, your section number, and the problem number on each page. Only sign the honor pledge on the first sheet. Show all of your work, and justify your answers. Scientific, but **not** graphing calculators are allowed. Unless the problem explicitly requests simplification, no simplification is necessary.

1. Differentiate the following functions:

(a) $f(x) = \frac{x^2 + 2}{x - 1}$

(b) $g(x) = x^2 e^{4x^2 + 8x} + e^\pi$

(c) $h(x) = \ln\left(\frac{x + 1}{2x - 1}\right)$

2. (a) Write the function $f(x)$ such that $f'(x) = -2f(x)$ and $f(0) = -5$.

(b) The half-life of Carbon-14 is 5730 years. Given an initial sample of 64 grams, how much Carbon-14 would be left after 22920 years?

(c) Find a real number k so that $(16)^x = e^{kx}$.

3. Use logarithmic differentiation to differentiate the following function:

$$f(x) = \sqrt{\frac{(4x + 1)^9(1 - 3x)^{16}}{(2x^2 + 4x)^6}}$$

4. \$7000 is put into a bank account that gains 6.5% interest annually, compounded continuously.

(a) Write an equation for the amount of money in the account t years after the account is opened.

(b) What is the balance in the account after 3 years?

(c) When is the account balance \$9000?

(d) What is the rate of growth of the account after 4 years?

5. Last night, super-intelligent squirrels escaped from an animal science lab as phase one of their nefarious scheme to take over the world. The squirrel population is expected to grow according to the equation

$$P(t) = \frac{4000}{1 + 39e^{-0.05t}}$$

where t is the number of weeks after the great squirrel escape.

(a) Find the initial population of squirrels.

(b) Find the maximum population of squirrels.

(c) How many weeks does it take until the population reaches 1000?
