

**Calculus I**  
**Practice Exam 1, Summer 2002**

1. Differentiate:

a)  $f(x) = \ln\left(\frac{x+1}{x-1}\right)$

b)  $g(x) = 5^x \log_5 x$

c)  $h(x) = 5^{\log_2(x^2+1)}$

2. Differentiate:

a)  $f(x) = \frac{e^x}{x^2}$

b)  $g(x) = 5^{x^2+1} = e^{(\ln 5)(x^2+1)}$

3. Integrate:

a)  $\int e^{\tan x} \sec^2 x dx$

b)  $\int_0^3 2^{x^2} dx$

4. Solve the initial value problem:  $y' = x(5 - y)$ ,  $y(0) = 1$ .

5. If I invest \$4000 in a fund, with an interest rate of 8%, compounded continuously, how long will it take for the fund to be worth \$10,000?

6. I invested \$6000 3 years ago in a fund bearing continuously compounded interest. Now that fund is worth \$8000. Assuming the same rate of interest, how much will an investment of \$10,000 be worth in 5 years?

7. Carbon<sup>14</sup> has a half life of 5801 years. How long does it take for a sample to be reduced to 80% its original size?

8. A certain autocatalytic chemical reaction proceeds according to the differential equation

$$\frac{dx}{dt} = .01 \frac{1-x^2}{x}$$

where  $x(t)$  is the fraction of the sample which is the resulting compound at time  $t$ , in seconds. If we start with  $x(0) = .2$ , how long does it take for  $x$  to reach .9?

9. Solve the initial value problem  $xy' - y = x^3$ ,  $y(1) = 2$ .

10. Solve the initial value problem  $y' - 2xy = e^{x^2}$ ,  $y(0) = 4$ .