Calculus II
Final, Fall 2002

1. Find the integrals:

a) $\int \frac{\ln(2x)}{x} dx$

b) $\int \frac{e^{x+1}}{e^x} dx$

2. Integrate $\int \frac{u^2+1}{u^2(u-1)} du$

3. Integrate $\int x \arctan x dx$

4. The deer population in Sad Valley, Idaho was 1200 in the year 2000, and in 2002 is 1450. Assuming continuous growth at the same rate, in what year will the population reach 2400?

5. Find thelimit. Show your work.

a) $\lim_{x\to 4} \frac{\sin(\pi x)}{x^2-16} =$

b) $\lim_{x\to 0} \frac{e^x-1-x}{2x^2} =$

c) $\lim_{x\to\infty} \frac{x^3}{e^x} =$

6. Do the integrals converge? If so, evaluate:

a) $\int_1^\infty e^{-2\theta} d\theta$

b) $\int_0^\infty \frac{dt}{1+t}$

7. Here are some series and sequences. Write the letter C if there is convergence, and the letter D if not.

a) $\lim_{n\to\infty} \frac{n!}{(2n)!}$ **b**) $\lim_{n\to\infty} \frac{2^n}{n^2}$ **c**) $\lim_{n\to\infty} \frac{3n^2-2n+1}{4n^3+1}$ **d**) $\Sigma_{n=1}^{\infty} \frac{n!}{(2n)!}$ **e**) $\Sigma_{n=1}^{\infty} \frac{n}{n^2+1}$

f) $\Sigma_{n=1}^{\infty} n(n-1)(n-3)2^n$ **g**) $\Sigma_{n=1}^{\infty} \frac{n(\ln(n))^2}{n^3+1}$ **h**) $\Sigma_{n=1}^{\infty} \frac{1}{(2n+1)(2n+2)}$

8. Find the focus of the parabola given by the equation $y^2-8x+2y+17=0$.

9. Find the area of the region enclosed by the curve given in polar coordinates by $r = 2\cos\theta$.

10. a) Find the general solution of the differential equation $y''+4y'+5y=0$.
b) Solve the initial value problem:

$$y''+4y'+5y=5 \ , \qquad y(0)=0, y'(0)=0 \ .$$