Math 142, Exam 3, Fall 1998

PRINT Your Name:_____ Recitation Time:_____

There are 9 problems on 4 pages. Eight of problems are each worth 10 points. The other problem has two parts and each part is worth 10 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **CHECK** your answer whenever possible.

NO CALCULATORS!

1. Find $\int_{-1}^{2} \frac{1}{(x-1)^2} dx$.

2. Find the limit of the sequence whose n$^{\text{th}}$ term is $a_n = (1 - \frac{1}{n})^{2n}$.

3. Find $\int \frac{\ln x}{x^3} dx$.

4. Find $\int \frac{5x^2 - 2x + 2}{x^3 + x} dx$.

5. Find $\int \sin^2 x \cos^3 x dx$.

6. (10 points for each part)
   (a) Find the Taylor polynomial of degree three, $P_3(x)$, for $f(x) = e^{-x}$ about $a = 0$.
   (b) Find an upper bound for the difference between $f(x)$ and $P_3(x)$ when $|x| \leq \frac{1}{10}$.

7. Find $\lim_{x \to \frac{\pi}{4}} \frac{\sin x}{x}$.

8. Use Trapezoidal rule with $n = 4$ to approximate $\int_{1}^{2} \frac{1}{x} dx$. (You may leave your answer as a sum of fractions; it is not necessary to express it as a decimal.)

9. Let $f(x) = x - \ln x$. Where is $f(x)$ increasing, decreasing, concave up, and concave down. Find the local maxima, local minima, and points of inflection of $y = f(x)$. Graph $y = f(x)$.