Math 142   Exam 1   Fall 2002

PRINT Your Name:_____

There are 10 problems on 5 pages. Each problem is worth 10 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **NO CALCULATORS! CHECK** your answer whenever possible.

1. Find $\int \frac{e^x}{\sqrt{1-e^x}}dx$. Check your answer.

2. Find $\int 2^x + x^2 dx$. Check your answer.

3. If $y = e^{\frac{1}{x^2}} + \frac{1}{e^{x^2}}$, then find $\frac{dy}{dx}$.

4. Find the volume of the solid generated by revolving the region bounded by $y = e^x$, the $x-$ axis, the $x = 1$ and $x = 2$, about the x-axis.

5. Let $f(x) = \frac{2x-1}{x+3}$ for $x \neq -3$. Find $f^{-1}(x)$. If you have time, verify that $f(f^{-1}(x)) = x$ for all x in the domain of $f^{-1}(x)$, and $f^{-1}(f(x)) = x$ for all x in the domain of $f(x)$.

6. If $y = \arcsin(2x^2)$, then find $\frac{dy}{dx}$.

7. Let $f(x) = \frac{x}{\ln x}$. What is the domain of $f(x)$? Where is $f(x)$ increasing, decreasing, concave up, and concave down? Find the local maxima, local minima, and points of inflection of $y = f(x)$. Find all vertical and horizontal asymptotes of $y = f(x)$. Graph $y = f(x)$.

8. Find the general solution of the differential equation $\frac{dy}{dt} + y = e^{-t}$. Check your answer.

9. Simplify $\sin[2\arccos(\frac{2}{3})]$.

10. A bacterial population grows at a rate proportional to its size. Initially the population is $10,000$ and after 10 days the population is $20,000$. How long will it take the population to triple? (You may leave "ln" in your answer.)