MATH 141 EXAMINATION I February 24, 2003

Name_____ ID #_____ Section #_____

Instructor _____

There are 14 questions in this examination. Ten are multiple choice problems, each of which has five possible answers. These problems are each worth 5 points. In addition there are four partial credit problems whose point values are indicated in the statement of the problem.

THE USE OF CALCULATORS, BOOKS, NOTES, ETC. DURING THE EXAMINATION IS FORBIDDEN.

CHECK THE EXAMINATION BOOKLET BEFORE YOU START. THERE SHOULD BE 14 PROBLEMS ON 10 PAGES (INCLUDING THIS ONE).

1 ..... (5) 2 ..... (5) 3 ..... (5) 4 ..... (5) 5 ..... (5) 6 ..... (5) 7 ..... (5) 8 ..... (5)

9 ..... (5) 10 ..... (5)

MC .....

11 .....(10)

12 .....(15)

13 .....(10)

14 .....(15)

Total .....

5 pts 1. If $f(x) = e^{x^2} + \ln \dfrac{1}{x}$, then what is $f'(x)$?

a) $x^2 e^{x^2-1} - \dfrac{1}{x^2}$

b) $2xe^{x^2} - \dfrac{1}{x}$

c) $(\ln e)e^{x^2} + \dfrac{1}{x^3}$

d) $2e^{x^2} + x$

e) $e^{x^2} + \dfrac{1}{\ln x}$

5 pts 2. Evaluate $\displaystyle\int_{\frac{1}{5}}^{5} \frac{\log_5(x)}{x} dx$.

a) 0

b) $\log_5 2$

c) $\log_5 25$

d) $2 \ln 5$

e) $5 \ln 5$

5 pts 3. Evaluate $\lim_{x\to\infty} \tan^{-1}(e^x)$.

a) ∞

b) 0

c) -1

d) $\dfrac{\pi}{2}$

e) The limit does not exist.

5 pts 4. Evaluate $\displaystyle\int \frac{dx}{x[4+(\ln x)^2]}$.

a) $\dfrac{1}{4+(\ln x)^2}+C$

b) $\ln|4+(\ln x)^2|+C$

c) $\dfrac{1}{2}\tan^{-1}\left(\dfrac{\ln x}{2}\right)+C$

d) $\ln|x|+\ln|4+(\ln x)^2|+C$

e) $\dfrac{\tan^{-1}(\ln|x|)}{2x}+C$

5 pts 5. Evaluate $\int_0^{\pi/4} \tan^2\theta d\theta$.

a) 0

b) $1 - \frac{\pi}{4}$

c) $\frac{\pi}{4} - 1$

d) $\sqrt{2}$

e) $2 + \frac{\pi}{2}$

5 pts 6. Evaluate $\int_1^2 \ln x \, dx$.

a) $2\ln 2$

b) $2\ln 2 - 1$

c) $2\ln 2 - 2$

d) $2\ln 2 - 3$

e) $-\frac{1}{2}$

5 pts 7. Evaluate $\lim_{x\to\pi} \dfrac{\sin(5x)}{x-\pi}$.

a) 5

b) -5

c) 5π

d) -1

e) 1

5 pts 8. If $f(x) = \sin^{-1}(x^2-1)$ and $x > 0$, then what is $f'(x)$?

a) $2x\cos^{-1}(x^2-1)$

b) $\cos^{-1}(x^2-1)$

c) $\dfrac{2}{\sqrt{2-x^2}}$

d) $\dfrac{1}{x\sqrt{2-x^2}}$

e) $\dfrac{2}{(x^4-2x^2+2)}$

5 pts 9. Suppose $f(x)$ is a one-to-one function defined on the interval $[-1, 5]$ and such that $f(0) = 4$, $f(1) = 3$, $f(2) = 2$, $f'(0) = -1$ $f'(1) = 2$, $f'(4) = 3$ and $f'(2) = 4$. What is $(f^{-1})'(4)$?

a) -1

b) 0

c) $\frac{1}{4}$

d) $\frac{1}{3}$

e) $\frac{1}{2}$

5 pts 10. Use Simpson's rule with $n = 4$ to approximate $\int_2^{10} \sqrt{1 + x^3}\, dx$.

a) $\frac{2}{3}[3 + 4\sqrt{65} + 2\sqrt{217} + 4\sqrt{513} + \sqrt{1001}]$

b) $\frac{2}{3}[3 + 2\sqrt{65} + 4\sqrt{217} + 2\sqrt{513} + \sqrt{1001}]$

c) $2[3 + 4\sqrt{65} + 2\sqrt{217} + 4\sqrt{513} + \sqrt{1001}]$

d) $\frac{1}{3}[3 + 4\sqrt{65} + 2\sqrt{217} + 4\sqrt{513} + \sqrt{1001}]$

e) $\frac{2}{3}[3 + \sqrt{65} + \sqrt{217} + \sqrt{513} + \sqrt{1001}]$

10 pts 11. Find the derivative of $f(x) = x^{\sin x}, x > 0$.

15 pts 12. Evaluate $\displaystyle\int \frac{5x^3 - 3x^2 + 2x + 1}{x^4 + x^2}\, dx.$

10 pts 13. Evaluate $\int \sin\sqrt{x}\,dx$.

15 pts 14. Evaluate $\displaystyle\int \frac{dx}{(25-x^2)^{3/2}}$.