MATH 152

Fall 1995

Exam I

Test Form B

NAME

ID#

INSTRUCTOR'S NAME

SECTION #

INSTRUCTIONS

1. In Part I (Problems 1—9), mark the correct choice on your SCANTRON sheet using a #2 pencil. Use the back of each page for scratch work. For your own records, record your responses on your exam (which will be returned to you). The SCANTRON will be collected after 1 hour and will not be returned.

2. In Part II (Problems 10–16), write all solutions in the space provided. Use the back of each page for scratch work, but all work to be graded must be shown in the space provided. CLEARLY INDICATE YOUR FINAL ANSWER.

Part I. MULTIPLE CHOICE, NO PART CREDIT, NO CALCULATORS

The SCANTRON forms will be collected at the end of 1 hour.

(6 points each)

1. $\int_0^2 \sqrt{4-x^2}\,dx =$

(a) 2π (b) 4π (c) 1 (d) 0 (e) π

2. Find $\lim_{x\to\infty} (e^x + \cosh x - 3\sinh x)$

(a) 0 (b) 1 (c) ∞ (d) -1 (e) $-\infty$

3. If $g(x) = \sin^{-1}(e^x)$, then $g^{'}(x) =$

(a) $\dfrac{1}{1+e^{(x^2)}}$ (b) $\dfrac{e^x}{\sqrt{1-e^{(x^2)}}}$ (c) $\dfrac{e^x}{1+e^{2x}}$ (d) $\dfrac{1}{\sqrt{1-e^{2x}}}$ (e) $\dfrac{e^x}{\sqrt{1-e^{2x}}}$

4. The derivative of $f(x) = \ln(\ln x)$ at $x = e$ is

(a) 1 (b) e (c) 0 (d) $2e^{-1}$ (e) e^{-1}

5. The growth rate of a certain bacteria culture is proportional to its size. If the bacteria culture doubles every 20 minutes, how long (in minutes) will it take the culture to reach 12 times its initial size?

(a) $\dfrac{20\ln 12}{\ln 2}$ (b) $\ln 6$ (c) 60 (d) $10\ln 6$ (e) $\dfrac{3\ln 12}{\ln 2}$

6. The equation of the tangent line to the curve $y = \cosh x$ at the point $(0, 1)$ is

(a) $y = \sinh x$ (b) $y = (\sinh x)x + 1$ (c) $y = 0$ (d) $y = x + 1$ (e) $y = 1$

7. Evaluate $\lim\limits_{t\to\infty} \dfrac{\sqrt{4t^2+1}}{\sqrt{t^2+4}} =$

(a) 4 (b) 2 (c) 1/2 (d) 1 (e) ∞

8. Find $\lim\limits_{x \to \frac{1}{2}} \dfrac{x - \frac{1}{2}}{\ln(2x)} =$

(a) $(\ln 2)^{-1}$ (b) 2 (c) 1/2 (d) doesn't exist (e) 1

9. $\displaystyle\int x \tan^{-1} x \, dx = \quad \left(\text{Hint : } \quad \frac{x^2}{1+x^2} = 1 - \frac{1}{1+x^2}\right)$

(a) $\dfrac{x^2}{2}\tan^{-1} x - \dfrac{x}{2} + C$

(b) $\dfrac{x^2+1}{2}\tan^{-1} x - \dfrac{x}{2} + C$

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

(d) $\dfrac{x^2}{2}\tan^{-1} x + \dfrac{1}{2}\sqrt{x^2-1} + C$

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

Part II. WORK OUT PROBLEMS, PART CREDIT will be given.

CALCULATORS ARE PERMITTED after the SCANTRONS are collected.

Show all relevant steps in your solution. Clearly indicate your answer. Unsupported answers will not be given credit. Only work shown in the space provided will be graded.

10. (8 points) The speedometer reading v on a car was observed at 60-sec intervals and recorded in the following chart. Use the Trapezoidal Rule to estimate the distance traveled by the car during the first 6 minutes.

t(sec)	0	60	120	180	240	300	360	420	480	540	600
v(m/sec)	20	21	23	25	26	27	28	30	32	33	34

11. (7 points) Below is the graph of $y = \sin^3 x$. Find the area of the shaded region.

12. (7 points) Find an explicit formula and the domain of definition of the inverse function for $y = \ln(1 + e^x)$.

13. (8 points) Compute $\int_0^\infty e^{-2x}\,dx$.

14. (5 points) Compute $\displaystyle\int \frac{1}{x^3 - x^2}\,dx$.

15. (6 points) A lighthouse is on a small island 3 km away from the nearest point P on a straight shoreline and its light makes four revolutions per minute. How fast is the beam of light moving along the shoreline when it is 1 km from P?

16. (5 points) Determine if $\int_2^{\infty} \left(\frac{1}{x-1} - \frac{1}{x} \right) dx$ converges or diverges. If the integral converges, evaluate it.