

MATH 152, Exam I, Version B
Spring, 1995

NAME

ID#

INSTRUCTOR'S NAME

SECTION #

INSTRUCTIONS

1. In Part I (problems 1 – 11), 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 12 – 18), 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.**

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

The SCANTRON forms will be collected at the end of 1 hour. (5 points each)

1. Find $\frac{d}{dx}[\ln(x^3 + x)]$.

- (a) $\frac{1}{x} + \frac{1}{x^2 + 1}$ (b) $\frac{4}{x}$ (c) $\frac{3x^2 + 1}{x^3 + x}$ (d) $\frac{1}{x^3 + x}$ (e) $\frac{1}{x^3} + \frac{1}{x}$

2. $\int_0^{\pi/6} \sin^3 \theta \cos \theta \, d\theta =$

- (a) $\frac{1}{4}$ (b) $\frac{1}{8}$ (c) $\frac{1}{16}$ (d) $\frac{1}{32}$ (e) $\frac{1}{64}$

3. $e^{\ln(3x) - \ln(x^3)} =$

- (a) $\frac{3+x}{x^3}$ (b) $3x - x^3$ (c) $\frac{3}{x^2}$ (d) $3 - 2x$ (e) $3 + x - x^3$

4. $\int_0^{\sqrt{3}} \frac{1}{x^2 + 1} \, dx =$

- (a) $\frac{\pi}{7}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{5}$ (d) $\frac{\pi}{4}$ (e) $\frac{\pi}{3}$

5. $\cos(\sin^{-1} x) =$

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

6. Determine $\lim_{x \rightarrow 2} \frac{\ln x - \ln 2}{x - 2}$.

- (a) 0 (b) $\frac{1}{2}$ (c) $\frac{1}{\ln 2}$ (d) 1 (e) ∞

7. $\int \tanh x dx =$

- (a) $\ln(\cosh x) + C$ (b) $-\ln(\cosh x) + C$ (c) $\coth x + C$
 (d) $-\operatorname{csch}^2 x + C$ (e) $\operatorname{sech}^2 x + C$

8. If $f(x) = e^{(x^2)}$, then $f'(3) =$

- (a) $6e^8$ (b) $9e^8$ (c) e^9 (d) $6e^9$ (e) e^6

9. Given:

$$f(1) = 2 \quad f(2) = 4 \quad f'(1) = 3 \quad f'(2) = 6$$

If $g(x)$ is the inverse function of $f(x)$, what is $g'(2)$?

- (a) $-\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $-\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$

10. $\int_0^1 \frac{x}{2x^2 + 3} dx =$

- (a) $\tan^{-1}(2)$ (b) $\tan^{-1}(5)$ (c) $\frac{1}{4} \ln\left(\frac{5}{3}\right)$ (d) $\frac{1}{4} \ln 5$ (e) $\frac{1}{2} \ln 5$

11. $\int_0^1 xe^{2x} dx =$

- (a) e^2 (b) $\frac{e^2}{2}$ (c) $\frac{e^2}{4}$ (d) $\frac{e^2 + 1}{4}$ (e) $\frac{e^2 - 1}{2}$

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 indicated your answer. Unsupported answers will not be given credit. Only work shown in the space provided will be graded.

12. (6 points) \$1000 is invested in an account earning 4% interest compounded continuously. How long does it take this investment to triple? Give your answer (in years) to two places after the decimal point.

13. (7 points) Evaluate $\int_2^3 \frac{1}{x^2 - 1} dx$.

14. (6 points) Find the area under the curve $y = \sqrt{4 - x^2}$, above the x -axis, from $x = 1$ to $x = 2$.

15. (7 points) The velocity of a rocket (in feet per second) is measured at two (2) second intervals and recorded in the following chart. Use the trapezoid rule to approximate the distance the rocket travelled from $t = 0$ to $t = 8$.

time	0	2	4	6	8
velocity	0	5	12	30	70

16. (7 points) Find $\lim_{x \rightarrow 0} \frac{\sin^2 x}{e^x - 1 - x}$.

17. (6 points) Find a continuous function $f(x)$ so that $\int_0^x f(t)dt = 2f(x) - 3$.

18. (6 points) In using Simpson's rule with n intervals to approximate $\int_a^b f(x)dx$, the error is at most $\frac{M(b-a)^5}{180n^4}$, where $|f^{(4)}(x)| \leq M$ for $a \leq x \leq b$. Using this estimate, what integer n should you use to guarantee that the Simpson's rule approximation to $\int_1^3 \ln(x)dx$ is within 10^{-6} of the exact answer?