

MATH 141

NAME _____

EXAM I

STUDENT NUMBER _____

OCTOBER 7, 2003

INSTRUCTOR _____

SECTION NUMBER _____

This examination will be machine processed by the University Testing Service. Use only a number 2 pencil on your scantron. On your scantron identify your name, this course (Math 140) and the date. Code and blacken the corresponding circles on your scantron for your student I.D. number and class section number. Code in your test form.

There are 9 multiple choice questions worth a total of 54 points. For each problem **five** possible answers are given, only one of which is correct. You should solve the problem, **circle** the letter of your answer in the exam form and **blacken** the corresponding space on the **scantron**. Mark only one choice; darken the circle completely (you should not be able to see the letter after you have darkened the circle). Check frequently to be sure the problem number on the test is the same as the problem number of the scantron. There are 4 partial credit questions. **In order to obtain full credit for these problems, all work must be shown. Credit will not be given for an answer not supported by work.** The point value for each partial credit question is given in parentheses to the right of the question number.

THE USE OF CALCULATORS IS NOT PERMITTED IN THIS EXAMINATION.

10. (11 pts.) _____
11. (11 pts.) _____
12. (11 pts.) _____
13. (14 pts.) _____
Total _____

**Do not
write in
the box to
the left.**

(1) Let $f(x) = 1 - e^{-x}$. Then $f(a) = f'(a)$ when

(a) $a = \ln 2$

(b) $a = -\ln 2$

(c) $a = \frac{1}{2}$

(d) $a = -\frac{1}{2}$

(e) $a = 0$

(2) Let $f(x) = \ln(x^2 - 3)$. Then the domain of $f(x)$ is:

(a) $(-\infty, -\sqrt{3}] \cup [\sqrt{3}, \infty)$

(b) $[\sqrt{3}, \infty)$

(c) $(\sqrt{3}, \infty)$

(d) $(-\infty, -\sqrt{3}) \cup (\sqrt{3}, \infty)$

(e) $(-\infty, \infty)$

- (3) The largest interval containing π on which $f(x) = \sin(2x)$ is one-to-one is:
- (a) $[\pi, 3\pi/2]$
 - (b) $[\pi/2, \pi]$
 - (c) $[0, \pi]$
 - (d) $(-\infty, \infty)$
 - (e) $[3\pi/4, 5\pi/4]$
- (4) Suppose $f(x)$ is one-to-one such that $f(5) = 1$, $f(0) = -5$, $(f^{-1})'(1) = 5$, and $(f^{-1})'(5) = 3$. What is $f'(5)$?
- (a) $\frac{1}{5}$
 - (b) -5
 - (c) $-\frac{1}{5}$
 - (d) 3
 - (e) $\frac{1}{3}$

(5) Evaluate

$$\int_{(\ln 2)^2}^{(\ln 3)^2} e^{\sqrt{x}} / \sqrt{x} dx$$

(Hint: Substitute $u = \sqrt{x}$)

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

(6) Evaluate $\int_0^{\pi/2} \sin^2 x \cos^3 x dx$.

- (a) 2/15
- (b) 1/5
- (c) 1/3
- (d) 2/5
- (e) 2/3

- (7) If $f(x) = e^{\cos^{-1}x}$, $-1 \leq x \leq 1$, then $f'(0)$ equals:
- (a) $e^{-\pi}$
 - (b) $-e^{\pi/2}$
 - (c) $e^{\pi/2}$
 - (d) e^{π}
 - (e) -1

- (8) Evaluate

$$\int_0^1 \frac{dx}{(x+1)(2-x)}$$

(Hint: Use partial fractions)

- (a) 0
- (b) $\ln 2$
- (c) $-\ln 2$
- (d) $2 \ln(2)/3$
- (e) $-2 \ln(2)/3$

(9) Evaluate $\int_0^1 \tan^{-1} x \, dx$. (*Hint: Use integration by parts*)

- (a) 0
- (b) $\cot(1) - (\ln 2)/2$
- (c) $\pi/4 + (\ln 2)/2$
- (d) $\pi/4 - (\ln 2)/2$
- (e) $\pi/4 + \ln 2$

(10) (11 points) Find

$$\frac{d}{dx}(x^{\cos x})$$

(11) (11 points) Evaluate

$$\int x^2 \sin(3x) dx$$

(12) (11 points) Use partial fractions to evaluate

$$\int_1^{\sqrt{3}} \frac{dx}{x^2(x^2 + 1)}$$

(13) (13 points) Evaluate

$$\int \frac{x^2 dx}{(1-x^2)^{3/2}}$$