MA 161-161E EXAM 3 SPRING 1999

Name: ______________________ I.D.#: ______________________

Section #: ______________________ TA's Name: ______________________

1. This package contains 8 pages and 12 problems, problems 1–10 are worth 8 points each, problem 11 is worth 9 points and problem 12 is worth 11 points. Correct answers with inconsistent work or no work may not be given credit.

2. Be sure to fill in your name, ID#, Section #, and the name of your recitation instructor.

3. The exam lasts 60 minutes.

4. No books, notes, or calculators, please.

1. The shortest distance of a point on the graph of $y = \sqrt{x}$ to the point $(4, 0)$ is equal to

A. $2\sqrt{2}$

B. $\dfrac{\sqrt{15}}{2}$

C. 2

D. 3

E. $\dfrac{5}{2}$

2. $\displaystyle \lim_{x \to -\infty} \frac{6x + 4x^2 + 5x^3}{7x^3 - 3x^2 - 14} =$

A. $\dfrac{6}{7}$

B. $\dfrac{4}{7}$

C. $\dfrac{5}{7}$

D. $-\dfrac{5}{7}$

E. Does not exist

3. All the inflection points of the graph of $f(x) = x^4 - 6x^2$ occur at

A. $x = 0, 3$

B. $x = 1$

C. $x = -1$

D. $x = -1, 1$

E. none

4. Find the lower sum $L_f(P)$ for $\int_1^4 \frac{1}{x}\,dx$ where $P = \{1, 3, 4\}$.

A. $\frac{5}{12}$

B. $\frac{7}{12}$

C. $\frac{3}{4}$

D. $\frac{11}{12}$

E. $\ln 4$

5. Let $G(x) = \int_{x^3}^{1} \sin(t^2)dt$. Then $G'(1) =$

A. $3 \sin 1$

B. 1

C. $-5 \sin 1$

D. -3

E. $-3 \sin 1$

6. Find a and b such that

$$\int_2^3 e^{x^2} dx - \int_a^b e^{x^2} dx = \int_4^3 e^{x^2} dx$$

A. $a = 2,\ b = 3$

B. $a = 2,\ b = 4$

C. $a = 3,\ b = 4$

D. $a = 4,\ b = 3$

E. $a = 4,\ b = 2$

7. For what value of k can the following integral be evaluated directly using a substitution.

$$5\int e^{t^3} t^k dt$$

A. $k = 0$

B. $k = 1$

C. $k = 2$

D. $k = 3$

E. $k = 4$

8. True–false: a statement is false unless true in all situations.

a. At a local maximum of a continuous function f we have $f'(x) = 0$.

b. If $f'(x) > 0$ on (a, b) the graph of f is concave up.

c. $\int \ln x dx = \frac{1}{x} + C$

d. $\int_0^x \sin t dt$ is increasing for $\frac{\pi}{2} < x < \pi$.

9. Compute the following integrals

a) $\displaystyle\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\, dx =$

$\boxed{}$

b) $\displaystyle\int \frac{x^3}{1+x^4}\, dx =$

$\boxed{}$

10. Give the area between the graph of $f(x) = \dfrac{\ln x}{x}$ and the x axis for $\dfrac{1}{2} \leq x \leq 2$ as a sum or difference of definite integrals of $\dfrac{\ln x}{x}$ (do not use absolute values). Do not integrate.

11. In the boxes indicate the substitutions to allow the integrals below to be integrated directly. Do not integrate. (9 points)

a) $\displaystyle\int x\sqrt{x+3}\,dx$ $u =$

b) $\displaystyle\int (\ln x)^3 x^{-1} dx$ $u =$

c) $\displaystyle\int \tan^5 x \sec^2 x dx$ $u =$

12. Sketch the graph of $f(x) = \ln(e^x + e^{-x})$. Find first and second derivatives and all relative extrema, intervals where graph is concave up and where concave down, and points of inflection. (11 points)

$f'(x) =$

$f''(x) =$

rel. max. at :

rel. min. at :

concave up on :

concave down on :

points of inflection :