MA 161 & 161E **FINAL EXAM** **December 2003**

Name	Student ID Number
Lecturer	Recitation Instructor

INSTRUCTIONS:

1. Fill in all the information requested above and on the scantron sheet.
2. This booklet contains 23 problems, each worth 8.5 points. You get 4.5 points for coming; the maximum score is 200 points.
3. For each problem circle the answer of your choice, and also mark it on the scantron sheet.
4. Work only on the pages of this booklet.
5. Books, notes, calculators are not to be used on this test.
6. At the end turn in your exam and scantron sheet to your recitation instructor.

1. $\lim_{x \to 2^+} \dfrac{2-x}{x^2-5x+6} =$

A. -4

B. ∞

C. $-\infty$

D. 1

E. 0

2. $\lim_{x \to 0} x \sin \dfrac{1}{x} =$

A. ∞

B. 2

C. 1

D. 0

E. limit does not exist

3. $\frac{d}{ds}(s \ln s) =$

A. $\ln s$

B. $1 + \ln s$

C. $\frac{\ln s}{s}$

D. 1

E. $(s+1)\ln s$

4. The 47th derivative of $f(x) = \cos 2x$ is

A. $-\sin 2x$

B. $-2^{47}\sin 2x$

C. $\sin 2x$

D. $2^{47}\sin 2x$

E. $-2^{47}\cos 2x$

5. If $xe^y - ye^x = \pi$ then $dy/dx =$

A. $\dfrac{y}{x}$

B. $\dfrac{\pi + ye^x}{xe^y}$

C. $\dfrac{ye^x + e^y}{xe^y + e^x}$

D. $\dfrac{y - e^x}{x - e^y}$

E. $\dfrac{ye^x - e^y}{xe^y - e^x}$

6. If $g(t) = f(\sin t)$ then $g'(t) =$

A. $f(\cos t)$

B. $f'(\cos t)$

C. $f'(\sin t) + \cos t$

D. $f'(\sin t)\cos t$

E. $f(\sin t)\cos t$

7. The slope of the tangent line to the curve $y = \dfrac{2}{x+3}$, at the point where $x = -2$, is

   A. -2

   B. -1

   C. 0

   D. 1

   E. 2

8. Consider the following statements for a function $f(x)$ defined for $-\infty < x < \infty$:

   I. If f is differentiable at -3 then it is continuous at -3.

   II. If f is continuous at -3 then $f(-3) = \lim_{x \to -3} f(x)$.

   III. If $f(-3) = \lim_{x \to -3} f(x)$ then f is continuous at -3.

   Which is true?

   A. Only I

   B. Only II

   C. Only I and II

   D. Only II and III

   E. All three are true

9. On the first day of Christmas (at 8 a.m.) my true love gave me 10 grams of radioactive substance. On the fourth day of Christmas (again at 8 a.m.) I had 3 grams left. What is the half–life of that substance, in days?

A. $\frac{\ln 10/3}{4}$

B. $\frac{\ln 8}{\ln 10/3}$

C. 2

D. $\frac{10 \ln 2}{3}$

E. Not possible to determine

10. If $g(x) = 1/4^x$ then $g'(1) =$

A. $\frac{1}{4}$

B. $-\frac{1}{4}$

C. $\ln 4$

D. $-\ln 4$

E. $-\frac{\ln 2}{2}$

11. A particle moves along a line $x = y$. When it reaches the point $(1, 1)$, its x coordinate increases at rate 3 ft/s. At what rate, in ft/s, does its distance to the point $(1, 0)$ change at this moment?

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. 3

D. $3\sqrt{2}$

E. 6

12. Linear approximation gives for $\sqrt[3]{24}$ the value

A. $3\frac{1}{27}$

B. 3

C. $2\frac{8}{9}$

D. $2\frac{5}{6}$

E. $2\frac{2}{3}$

13. The maximum of $(1-x)e^x$ on $(-1,1)$ is

A. 0

B. 1

C. $2/e$

D. $2e$

E. e

14. Suppose an everywhere differentiable function h satisfies $h(2) = 4$, $h(5) = 6$. The mean value theorem implies that there is a

A. c in $(4,6)$ such that $h'(c) = 2/3$

B. c in $(4,6)$ such that $h'(c) = 3/2$

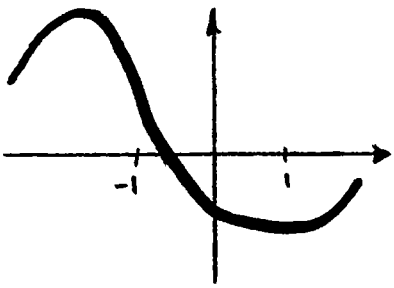
C. c in $(2,5)$ such that $h'(c) = 2/3$

D. c in $(2,5)$ such that $h'(c) = 3/2$

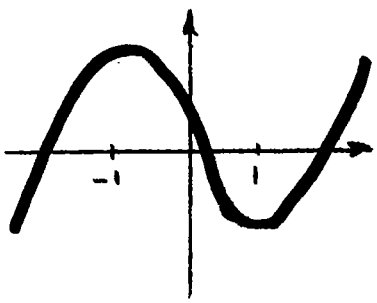
E. c in $(2,5)$ such that $h'(c) = 5$

15. If $\varphi''(x) = (x-1)^2(x+1)$, the graph of φ can be

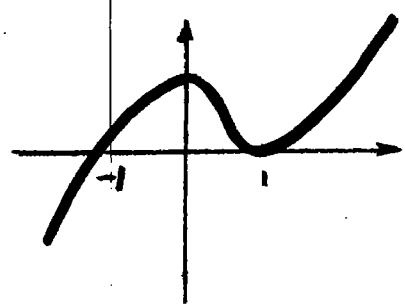
A.



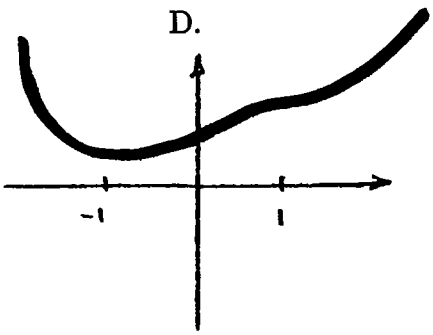
B.



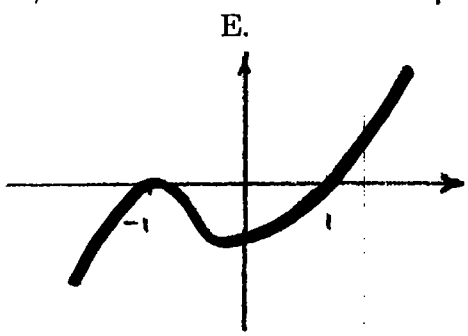
C.



D.



E.



16. If $g'(x) = x^2 - 1$, $g(2) = 1/3$ then $g(0) =$

A. $-1/3$

B. 0

C. 1/2

D. 2/3

E. 1

17. For F a differentiable function on $(-\infty, \infty)$ and c a real number, which statement is true?

I. If F has a local maximum at c then $F'(c) = 0$.

II. If $F'(c) = 0$ then F has a local maximum or minimum at c.

A. Neither is true

B. Only I is true

C. Only II is true

D. Both are true

E. None of the above answers is correct

18. $\sum_{i=1}^{3}(2i-1)^2 =$

A. 7

B. 15

C. 22

D. 27

E. 35

19. $\int_1^4 \frac{dx}{x\sqrt{x}} =$

A. 16

B. 8

C. 6

D. 3

E. 1

20. If $\int_3^2 f(x)dx = 3$ and $\int_5^2 f(x)dx = 4$ then $\int_3^5 f(x)dx =$

A. -7

B. -1

C. 1

D. 7

E. 12

21. If $\psi(x) = \begin{cases} 1, & \text{if } x \leq 1 \\ 1/x, & \text{if } x > 1 \end{cases}$ then $\int_0^e \psi(x)dx =$

A. 1

B. $1\ \frac{1}{2}$

C. 2

D. $2e$

E. $2e + 1$

22. If $J(x) = \int_x^{2x^2} (\ln t)^{1/2} dt$ then $J'(e) =$

A. 0

B. 1

C. $\sqrt{2} - 2e \ln 2$

D. $\ln 4 - e\sqrt{2}$

E. $4e\sqrt{2 + \ln 2} - 1$

23. $\int_0^1 \frac{e^x}{2e^x - 1}\, dx =$

A. $\frac{e}{2e-1}$

B. $\frac{\ln(2e-1)}{2}$

C. $\frac{e-1}{2e-3}$

D. $\frac{e-1}{2e-1}$

E. $\ln \frac{e}{(2e-1)}$