MA161 **EXAM 2** **October 15, 1997**

Name: _____

ID #: _____

Recitation Instructor _____ Time of Recitation _____

Section #: _____

Instructions:

1. Fill in your name, student ID number and division and section number on the mark–sense sheet. Also fill out the information requested above.
2. This booklet consists of 6 pages. There are 14 questions, each worth 7 points.
3. Mark your answers on the mark–sense sheet. Please show your working in this booklet.
4. No books, notes or calculator may be used.
5. When you are finished with the exam hand this booklet and the mark–sense sheet, in person, to your instructor.

1. If $f(x) = x^3 \ln x,\ f'(x) =$

A. $3x$

B. $3x^2 \ln x + x^2$

C. $x^2 \ln x + 3x^2$

D. $\dfrac{3}{x^2}$

E. $3x^2 + \dfrac{1}{x}$

2. If $f(t) = \dfrac{2+t}{3-t}, \qquad f'(t) =$

A. $\dfrac{5}{(3-t)^2}$

B. $\dfrac{1-2t}{(3-t)^2}$

C. $\dfrac{5+2t}{3-t}$

D. $\dfrac{-1}{(3-t)}$

E. $\dfrac{5+2t}{(3-t)^2}$

3. If $f(x) = \ln(\cos(2x)),\ f'(x) =$

A. $\tan(2x)$

B. $-2\tan(2x)$

C. $2\tan(2x)$

D. $\dfrac{-\sin 2x}{2x}$

E. $\dfrac{1}{\cos(2x)}$

4. Given that $f'(8) = a$ and $f'(2) = b$, evaluate $\dfrac{d}{dx}(f(x^3))$ at $x = 2$.

   A. $12a$

   B. $3b$

   C. ab

   D. $12b$

   E. $3a$

5. If $g(x) = \sin(x^4)$ then $g''(x) =$

   A. $4x^3 \cos x^4 + \cos(x^4)$

   B. $12x^2 \cos(x^4) - 16x^6 \sin(x^4)$

   C. $4x^2 \sin(x^4) + \cos(x^4)$

   D. $\sin(4x^3) + x^4 \cos(x^4)$

   E. None of the above

6. An object is moving along the x–axis. At time t its position is given by

$$h(t) = -1/t^2 + 3t + 8.$$

   Its acceleration at time t is

   A. $-\dfrac{3}{t^4}$

   B. $-1/t^3$

   C. 3

   D. $-6/t^4$

   E. $-\dfrac{2}{t^3}$

7. If $x^2 + y^2x + 3y^2 = 5$, then $\dfrac{dy}{dx} =$

A. $\dfrac{-y^2 - 2x}{2xy + 6y}$

B. $\dfrac{-2x}{2x + 6}$

C. $\dfrac{y^2 + 2x}{2xy + 6y}$

D. $\dfrac{5 - x^2}{3 + x}$

E. $\dfrac{-2x + y^2}{2xy + 6y}$

8. The sides of an equilateral triangle are increasing at the rate of 2 cm/sec. At what rate is the area of the triangle increasing when the length of the sides is 8 cm?

A. $1/4 \quad \text{cm}^2/\text{sec}$

B. $2\sqrt{3} \quad \text{cm}^2/\text{sec}$

C. $8\sqrt{3} \quad \text{cm}^2/\text{sec}$

D. $16 \quad \text{cm}^2/\text{sec}$

E. $5 \quad \text{cm}^2/\text{sec}$

9. Gas is being pumped into a spherical balloon at the rate of 8 ft^3/min. How fast is the radius of the balloon increasing when the radius of the balloon is 2 ft?

A. $\dfrac{1}{2\pi}$ ft/min

B. $\dfrac{8}{\pi}$ ft/min

C. $-\dfrac{1}{2\pi}$ ft/min

D. $\dfrac{\pi}{8}$ ft/min

E. $4\pi^2$ ft/min

10. Given that $(27)^{1/3} = 3$, use linear approximation to approximate $(25)^{1/3}$.

A. $3 - \dfrac{1}{27}$

B. $3 - \dfrac{5}{27}$

C. $3 - \dfrac{2}{27}$

D. $3 - \dfrac{6}{27}$

E. $3 - \dfrac{4}{27}$

11. The critical numbers of the function xe^{3x} are

A. 0

B. there are none

C. 3

D. $-1/3$

E. -3

12. Let $f(x) = 2x^3 - 3x,\ g(x) = 3x + 2\sin x$. Which one of the following statements is true?

A. Both f and g are increasing on $(-\infty, \infty)$.

B. f is increasing and g is decreasing on $(-\infty, \infty)$.

C. g is increasing on $(-\infty, \infty)$, f is not.

D. f is decreasing and g is increasing on $(-\infty, \infty)$.

E. Both f and g are decreasing on $(-\infty, \infty)$.

13. The lengths of the two perpendicular sides of a right triangle add up to 12 ft. What is the maximal area of the triangle?

A. $12\ \text{ft}^2$

B. $18\ \text{ft}^2$

C. $72\ \text{ft}^2$

D. $81\ \text{ft}^2$

E. $144\ \text{ft}^2$

14. All antiderivatives of $1 + \cos x$ are

A. $\cos x + c$

B. $-\sin x + c$

C. $x + \sin x + c$

D. $x + x\cos x + c$

E. $x - \sin x + c$