

MATH 161 – FALL 1999 – SECOND EXAM  
October 28, 1999

STUDENT NAME: \_\_\_\_\_

STUDENT ID NUMBER: \_\_\_\_\_

RECITATION INSTRUCTOR: \_\_\_\_\_

INSTRUCTIONS:

1. This test booklet has 6 pages including this one.
  2. Fill in your name, your student ID number, and your recitation instructor's name above.
  3. Use a number 2 pencil on the mark-sense sheet (answer sheet).
  4. On the mark-sense sheet, fill in the recitation instructor's name and the course number.
  5. Fill in your name and student ID number, blacken the appropriate spaces, and sign the mark-sense sheet.
  6. Mark the the division and section number of your class and blacken the corresponding circles, including the circles for the zeros. If you do not know your division and section number ask your instructor.
  7. There are 11 questions, each worth 9 points. Blacken your choice of the correct answer in the spaces provided for questions 1-11. Turn in BOTH the answer sheet and the question sheets to your instructor when you are finished.
  8. No books, notes or calculators may be used.
- 

1)  $\frac{d}{dx} \left( \frac{\ln(x^2)}{x} \right) =$

a)  $\frac{\ln x}{x^2}$

b)  $\frac{x^3}{\ln x^3}$

c)  $\frac{\ln x^3}{x^3}$

d)  $\frac{2 - 2 \ln x}{x^2}$

e)  $(\ln x)^2$

2) A curve on the plane is given by  $3x^2 + y^2 = 7$ . Which of the following is the slope of the tangent line to this curve at  $(1, 2)$ ?

a)  $-\frac{3}{2}$

b)  $-\frac{1}{2}$

c) 1

d)  $\frac{3}{2}$

e)  $\frac{7}{2}$

3) Approximate  $(24)^{1/3}$  using linear approximation.

a)  $\frac{8}{3}$

b)  $\frac{14}{5}$

c)  $\frac{26}{9}$

d)  $\frac{27}{10}$

e) 3

4) The maximum and minimum of  $f(x) = x^2 - 2x^3$  on  $[0, 1]$  are

- a) maximum  $\frac{1}{3}$ , minimum 0
- b) maximum  $\frac{1}{9}$ , minimum 0
- c) maximum  $\frac{1}{27}$ , minimum 0
- d) maximum  $\frac{1}{27}$ , minimum  $-1$
- e) maximum  $\frac{1}{9}$ , minimum  $-1$

5) The interval(s) on which the function  $f(x) = x^3 - 3x^2 - 9x + 1$  is increasing is (are)

- a)  $[-1, 3]$
- b)  $(-\infty, 3]$
- c)  $(-\infty, -1]$  and  $[0, 3]$
- d)  $[-1, 0]$  and  $[3, \infty)$
- e)  $(-\infty, -1]$  and  $[3, \infty)$

6) An exponentially growing population of certain bacteria doubles in size every three days. How many days will it take for the population to be eight times the initial one?

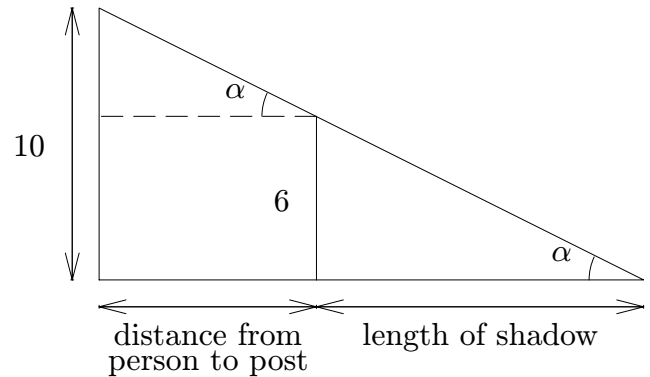
- a)  $\frac{\ln 8}{\ln 3}$
- b)  $3 \ln 8$
- c) 9
- d) 12
- e) 10

7) The derivative of a function  $f(x)$  is  $f'(x) = (x - 1)^2(x - 2)(x + 3)$ . Which of the following is correct?

- a)  $f(1)$  is a relative maximum,  $f(2)$  and  $f(-3)$  are relative minima.
- b)  $f(1)$  is a relative minimum,  $f(2)$  and  $f(-3)$  are relative maxima.
- c)  $f(2)$  is a relative minimum,  $f(1)$  and  $f(-3)$  are relative maxima.
- d)  $f(-3)$  is a relative maximum,  $f(2)$  a relative minimum and  $f(1)$  is neither.
- e)  $f(2)$  is a relative maximum,  $f(-3)$  a relative minimum and  $f(1)$  is neither.

- 8) A 10 ft tall lamp post casts a shadow on level ground of a 6 ft person walking away from the lamp post. Find the rate at which the shadow is increasing when the person is walking at 3 miles per hour.

- a)  $\frac{5}{3}$  miles per hour
- b) 2 miles per hour
- c) 6 miles per hour
- d)  $\frac{3}{2}$  miles per hour
- e)  $\frac{9}{2}$  miles per hour



- 9) The product of three positive numbers is 48, one of them is three times another. Find the minimum of their sum.

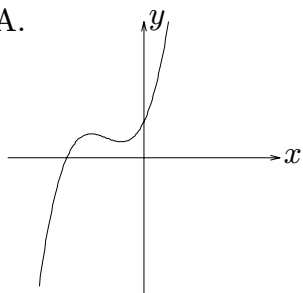
- a) 6
- b) 12
- c) 16
- d) 24
- e) 48

10) What is the value of the following limit?  $\lim_{x \rightarrow \infty} (4 + 3x - \sqrt{9x^2 + 4}) =$

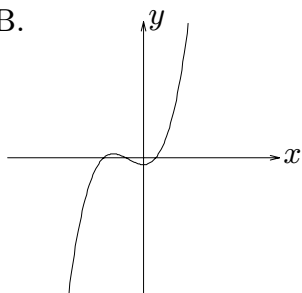
- a) 0
- b) 4
- c)  $\infty$
- c) 1
- e) 2

11) The graph of the function  $f(x) = x^3 + 2x^2 + x + 1$  looks most like

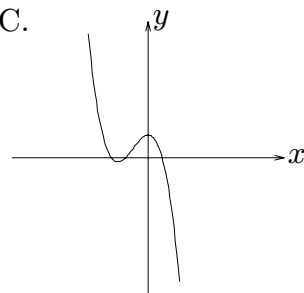
A.



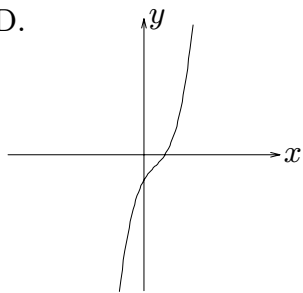
B.



C.



D.



E.

