MATH 161 FALL 1999 FINAL EXAM

STUDENT NAME: _____

STUDENT ID NUMBER: _____

RECITATION INSTRUCTOR: _____

INSTRUCTIONS:

1. Fill in your name, student ID number and division and section numbers on the mark-sense sheet. Also fill in the information requested above
2. This test booklet has 10 pages including this one. There are 20 questions, each worth 10 points.
3. Use a number 2 pencil to mark your choice of the correct answer in the spaces provided for questions 1-20 in the mark-sense sheet. Also show your work in this booklet.
4. Turn in BOTH the answer sheet and the question sheets to your instructor when you are finished.
5. No books, notes or calculators may be used.

1)

$$\lim_{x \to 5} \frac{\sqrt{x} - \sqrt{5}}{x^2 - 5x} =$$

a) $\sqrt{5}$

b) $2\sqrt{5}$

c) $\dfrac{1}{\sqrt{5}}$

d) $\dfrac{1}{2\sqrt{5}}$

e) $\dfrac{1}{10\sqrt{5}}$

2)

$$\lim_{x \to 1^-} \frac{x^2 - 1}{|x - 1|} =$$

a) -1

b) 1

c) -2

d) 2

e) 3

3)

$$\lim_{x \to -\infty} \frac{x - x^3}{1 + 2x^2} =$$

a) $\frac{1}{2}$

b) 1

c) -1

d) ∞

e) $-\infty$

4) Which of the following statements are true?

I. If a function $f(x)$ is continuous at $x = a$ it is also differentiable at $x = a$.

II. If $f(x)$ is continuous for all x and $f'(a) = 0$ then $f(a)$ is a relative maximum or minimum of f.

III. If $g(x)$ is differentiable and $g'(x) > 0$ for x in (a, b), then the maximum of g on $[a, b]$ is $g(b)$.

a) Only III

b) Only I and II

c) Only I and III

d) Only II and III

e) Only I

5) The derivative of $f(x) = \sin\left(4x^3 + \pi e^{4x} + \pi\cos(x)\right)$ at $x = 0$ is

a) π

b) 2π

c) 3π

d) 4π

e) 5π

6) The slope of the tangent line to the curve $x^2 - y^{3/2} = 1$ at $(3, 4)$ is

a) 2

b) 3

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

d) 5

e) 8

7) Capital, deposited in a bank at a fixed interest rate, will increase exponetially in value. Suppose the initial deposit of $ 1,000 increases to $ 1,500 in six years. How much will it be after 9 years?

a) $\sqrt{\frac{3}{2}}500$

b) $1000\left(\frac{3}{2}\right)^{3/2}$

c) $1000^{3/2}$

d) $1500\ln\left(\frac{3}{2}\right)$

e) 1750

8) A 5 foot ladder is leaning against a vertical wall. If the top of the ladder is falling at $\frac{1}{2}$ ft/sec, how fast is the bottom of the ladder moving away from the wall when its top is 3 feet above the floor?

a) 2 ft/sec

b) $\frac{3}{2}$ ft/sec

c) 3 ft/sec

d) $\frac{3}{4}$ ft/sec

e) $\frac{3}{8}$ ft/sec

9) The minimum value of the sum of a positive number and four times its reciprocal is

a) 1

b) 4

c) 2

d) $2\sqrt{2}$

e) 6

10) The function $f(x) = x^x$ is defined for $x > 0$. The interval where f is increasing is

a) $[1, \infty)$

b) $[e^{-1}, e]$

c) $[e^{-1}, \infty)$

d) $[e, \infty)$

e) $(0, e]$

11) The derivative of a function $f(x)$ is given by

$$f'(x) = (x-2)^2(x-1)(x+1)^3(x-3)^4.$$

Which of the following is correct?

a) $f(2)$ and $f(3)$ are relative maxima, $f(1)$ and $f(-1)$ are relative minima.

b) $f(2)$ and $f(3)$ are relative minima, $f(1)$ and $f(-1)$ are relative maxima.

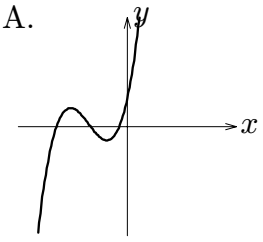
c) $f(1)$ and $f(-1)$ are relative maxima, $f(2)$ and $f(3)$ are neither.

d) $f(-1)$ is a relative maximum, $f(1)$ is a relative minimum, $f(2)$ and $f(3)$ are neither.

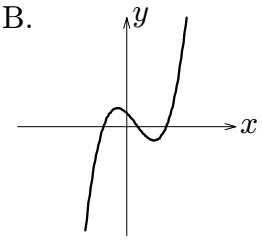
e) $f(-1)$ is a relative minimum, $f(1)$ is a relative maximum, $f(2)$ and $f(3)$ are neither.

12) Which of the following looks most like the graph of $f(x) = 3x^3 + 4x^2 + 3x + 2$.

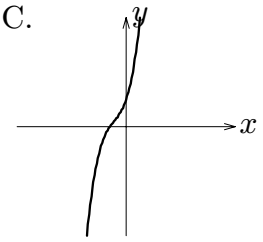
A.



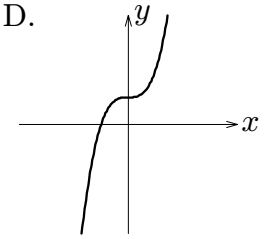
B.



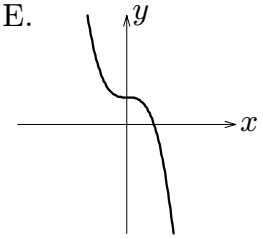
C.



D.



E.



13)

$$\int_0^3 \frac{x}{\sqrt{x+1}}\,dx =$$

a) 1

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

c) $\frac{5}{3}$

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

e) $\frac{5}{2}$

14)

$$\int_0^1 \frac{d}{dx}\ln(1+x^6)\,dx =$$

a) $\frac{1}{2}$

b) $\ln(1+\sqrt{2})$

c) $\ln(2)$

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

e) $\frac{\ln(1+\sqrt{2})}{2}$

15)

$$\int_0^1 \frac{7^x}{1+7^x}\,dx =$$

a) $\dfrac{\ln 4}{\ln 7}$

b) $\dfrac{\ln 3}{\ln 7}$

c) $\dfrac{1}{\ln 7}$

d) $\ln 7$

e) $2\ln 7$

16)

$$\int_0^{\frac{1}{2\sqrt{2}}} \frac{1}{\sqrt{1-4x^2}}dx =$$

a) $\dfrac{\pi}{3}$

b) $\dfrac{\pi}{4}$

c) $\dfrac{\pi}{6}$

d) $\dfrac{\pi}{7}$

e) $\dfrac{\pi}{8}$

17)

$$\int_0^{\frac{1}{2}} \frac{2\,dx}{1+4x^2} =$$

a) $\frac{\pi}{4}$

b) $\frac{\pi}{6}$

c) $\frac{\pi}{8}$

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

e) $\frac{\pi}{5}$

18) What is the value of

$$\frac{d}{dx}\int_1^{3x^2+2} \frac{1}{\sqrt{t^2+1}}\,dt \text{ at } x=1?$$

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

b) $\frac{6}{\sqrt{26}}$

c) $\frac{4}{\sqrt{8}}$

d) $\frac{2}{\sqrt{26}}$

e) $\frac{2}{\sqrt{27}}$

19) If $f(x) = x^5 + x^3$, then $\left(f^{-1}\right)'(2)$ is equal to

a) 1

b) $5^4 + 35^2$

c) 2

d) 8

e) $\frac{1}{8}$

20) The area of the region bounded by the curves $y = x^2 + 1$ and $y = -2x^2 + 13$ is

a) 6

b) 32

c) 20

d) 12

e) 40