Name:____________________________

Student ID:__________________________

Section:____________________________

Instructor:__________________________

Math 113 (Calculus II)
Exam 3 RED

Nov. 18-22, 2010; late day Nov. 23, 2010

Instructions:

- For questions which require a written answer, show all your work. Full credit will be given only if the necessary work is shown, justifying your answer.
- Simplify your answers.
- Calculators are not allowed. Textbooks are not allowed. Notes are not allowed.
- Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
- Please do not talk about the exam with other students until after the last day to take the exam.

For Instructor use only.

#	Possible	Earned
MC	35	
8	7	
9	8	
10	10	
11	10	
12	10	
13	10	
14	10	
Total	100	

Part I: Multiple Choice *Mark the correct answer on the bubble sheet provided. Responses written on your exam will be ignored.*

1. The sequence $\left\{\frac{\sin^2 n}{n}\right\}$ is

   a) increasing, bounded, and divergent,
   b) bounded and divergent,
   c) bounded and converges to 1,
   d) bounded and converges to 0,
   e) unbounded and divergent,
   f) None of these.

2. Find the values of p for which the series $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^p}$ is convergent.

   a) $p > 0$
   b) $p > 1$
   c) $p > 2$
   d) $p > 3$
   e) $p > 4$
   f) $p > 5$

3. If

$$s = \sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k} \qquad \text{and} \qquad s_n = \sum_{k=1}^{n} \frac{(-1)^{k+1}}{k},$$

   then the n^{th}-partial sum s_n is an approximation of s. Which of the following statements is true for s_3?

   a) $s_3 > s$ and $|s_3 - s| > \frac{1}{4}$
   b) $s_3 < s$ and $|s_3 - s| > \frac{1}{4}$
   c) $s_3 > s$ and $|s_3 - s| < \frac{1}{4}$
   d) $s_3 < s$ and $|s_3 - s| < \frac{1}{4}$

4. Determine the interval of convergence for the power series

$$\sum_{n=3}^{\infty} \frac{n}{5^n}(x+2)^n.$$

   a) Converges only for $x = -2$
   b) $(-\infty, \infty)$
   c) $(-5, 5)$
   d) $(-5, 5]$
   e) $(-7, 3)$
   f) $[-7, 3)$.

5. Use a power series centered at $x = 0$ to approximate the integral

$$\int_0^{1/2} \frac{1}{1-x^3}\, dx.$$

   Find the sum of the first two nonzero terms of this series.

   a) $9/16$
   b) $3/4$
   c) $33/64$
   d) $17/32$
   e) 2
   f) none of the above

6. What is the sum of the series
$$\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{4^{2n+1}(2n+1)!}?$$

a) $\frac{1}{2}$ b) $\frac{\sqrt{2}}{2}$ c) $\frac{\sqrt{3}}{2}$

d) 0 e) 1 f) none of the above

7. The Maclaurin series for $f(x) = \frac{x}{\sqrt{1+x}}$ is

a) $x + x^2 + x^3 + \cdots,$ b) $x - x^2 + x^3/2 + \cdots,$

c) $x - x^2/2 + 3x^3/8 + \cdots,$ d) $x + x^2/2 - x^3/6 + \cdots,$

e) $x/2 + x^2/3 + x^3/4 + \cdots,$ f) none of the above.

Part II: *In the following problems, show all work, and simplify your results.*

8. (7 points) A ball is dropped from 100 feet. Every time it hits the ground, it rebounds to 1/3 of its previous height. Find the total distance the ball travels.

9. (8 points) Determine whether the series is absolutely convergent, conditionally convergent, or divergent. (For full credit you must give a correct explanation.)

$$\sum_{n=1}^{\infty} \frac{n}{(n^7 + n^2)^{1/3}}$$

10. (10 points) Determine whether the series is absolutely convergent, conditionally convergent, or divergent. (For full credit you must give a correct explanation.)

$$\sum_{n=3}^{\infty} \frac{(-1)^n n}{\sqrt{n^3 - 2}}$$

11. (10 points) Determine for which values of p the following sum converges.

$$\sum_{n=1}^{\infty} \frac{\sin(\frac{1}{n})}{n^p}$$

12. (10 points) Find a power series centered at $x = 0$ for $\dfrac{x}{(1-2x^2)^2}$. Express it in summation notation and give the first 4 non-zero terms.

13. (10 points) Find the Taylor series for $f(x) = \sin(x)$ centered at $a = \pi/2$, AND compute the radius of convergence for this Taylor series.

14. (10 points) Find the first TWO nonzero terms in the Maclaurin series of $x\sec(x/3)$.