Math 132   **Exam 2**   **Spring 2015**

Name: _____

ID Number: _____

Section Number: _____

Section	Instructor	Day/Time		Section	Instructor	Day/Time
1	Farelli	MWF 10:10		9	Benincasa	TuThu 1:00
2	Farelli	MWF 9:05		10	Benincasa	TuThu 2:30
3	Clark	MWF 11:15		11	Buskin	MWF 10:10
4	Clark	MWF 12:20		12	Yaping	MWF 12:20
5	Brown	MW 2:30		13	Yaping	MWF 1:25
6	Brown	MW 4:00		15	Buckman	TuThu 11:30
7	Duanmu	TuThu 8:30		16	Wen	TuThu 1:00
8	Oloo	TuThu 10:00		17	Wen	TuThu 2:30

- No papers or notes may be used.

- Please don't just give an answer. Clearly explain how you get it, providing appropriate mathematical details. **An answer of 'convergent' or 'divergent' with no supporting work will be awarded zero points**

- This is a 2 hour exam.

Question	Grade
MC Total	
6	‖
7	‖
8	‖
9	‖
Total (out of 100)	

Mutiple Choice Section: Choose the one option that best answers the question. There is no partial credit for questions 1-5.

1. [5 points] Consider the following:

$$a_n = \frac{n^3}{3n^3 + 5}.$$

I. a_n converges
II. a_n diverges
III. $\sum_{n=1}^{\infty} a_n$ converges
IV. $\sum_{n=1}^{\infty} a_n$ diverges

Which of the following is true?

(a) I & III

(b) I & IV

(c) II & III

(d) II & IV

2. [5 points] Which of the following are true for the Test for Divergence:

I. If $\lim_{n \to \infty} a_n$ does not exist, then $\sum_{n=0}^{\infty} a_n$ diverges.

II. If $\lim_{n \to \infty} a_n$ exists but is not 0, then $\sum_{n=0}^{\infty} a_n$ diverges.

III. If $\lim_{n \to \infty} a_n = 0$, then $\sum_{n=0}^{\infty} a_n$ converges.

(a) I & II

(b) I & III

(c) I, II & III

(d) II & III

3. [5 points] Consider two positive series $\sum a_n$ and $\sum b_n$ with $a_n \le b_n$. Which of the following is definitely true?

   (a) If $\sum a_n$ converges, then $\sum b_n$ converges.

   (b) If $\sum b_n$ diverges, then $\sum a_n$ diverges.

   (c) If $\sum b_n$ converges, then $\sum a_n$ converges.

   (d) If $\lim\limits_{n \to \infty} \frac{a_n}{b_n} = 0$, then both $\sum a_n$ and $\sum b_n$ converge or both diverge.

4. [5 points] Determine if the following series converges, and if so, the value it converges to.
$$\sum_{n=1}^{\infty} (-1)^n \frac{7 \cdot 4^n}{3^n}.$$

   (a) -21

   (b) -4

   (c) 3

   (d) divergent

5. [5 points] Which of the following yields an *inconclusive* result for the Root Test?

   (a) $\lim\limits_{n \to \infty} \sqrt[n]{|a_n|} = 1$

   (b) $\lim\limits_{n \to \infty} \sqrt[n]{|a_n|} = \infty$

   (c) $\lim\limits_{n \to \infty} \sqrt[n]{|a_n|} = L < 1$

   (d) $\lim\limits_{n \to \infty} \sqrt[n]{|a_n|} = L > 1$

   Please fill in your letter answer for questions 1-5 below:

   (1) _____   (2) _____   (3) _____   (4) _____   (5) _____

Free Response Portion: Show all work for each of the following questions. Partial credit may be awarded for questions 6-9. You will receive no credit for an answer of "convergent" or "divergent" without supporting work.

6.

(a) [5 points] Evaluate the following integral.

$$\int \frac{y}{y^2 - 2y - 3} \, dy$$

(b) [10 points] Does the following integral converge or diverge? If it converges, what does it converge to?

$$\int_2^3 \frac{1}{\sqrt{3-x}} \, dx$$

7.

(a) [10 points] Find the values of x for which the series is convergent.

$$\sum_{n=0}^{\infty} (3)^{n+1} (x+4)^n$$

(b) [10 points] Does the series converge or diverge? State which test you used and clearly show that the series meets the conditions to use this test.

$$\sum_{n=1}^{\infty} \frac{\cos^2(n)}{5^n}$$

8.

(a) [10 points] Does the series converge or diverge? State which test you used and clearly show that the series meets the conditions to use this test.

$$\sum_{n=1}^{\infty} \frac{4n}{6n^2 + 2n + 8}$$

(b) [10 points] Does the series converge or diverge? State which test you used and clearly show that the series meets the conditions to use this test.

$$\sum_{n=3}^{\infty} \frac{\ln(n^2)}{n}$$

9.

(a) [10 points] Does the series absolutely converge, conditionally converge, or diverge? State which test you used and clearly show that the series meets the conditions to use this test.

$$\sum_{n=1}^{\infty} \frac{n^3(n+1)!}{e^n n!}$$

(b) [10 points] Does the series absolutely converge, conditionally converge, or diverge? State which test you used and clearly show that the series meets the conditions to use this test.

$$\sum_{n=2}^{\infty}(-1)^{n+1}\frac{5}{3\sqrt{n}-3}$$

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