Math 116 — Practice for Exam 2

Generated October 29, 2018

Name: ______________________________

Instructor: ______________________ Section Number: ________

1. This exam has 9 questions. Note that the problems are not of equal difficulty, so you may want to skip over and return to a problem on which you are stuck.
2. Do not separate the pages of the exam. If any pages do become separated, write your name on them and point them out to your instructor when you hand in the exam.
3. Please read the instructions for each individual exercise carefully. One of the skills being tested on this exam is your ability to interpret questions, so instructors will not answer questions about exam problems during the exam.
4. Show an appropriate amount of work (including appropriate explanation) for each exercise so that the graders can see not only the answer but also how you obtained it. Include units in your answers where appropriate.
5. You may use any calculator except a TI-92 (or other calculator with a full alphanumeric keypad). However, you must show work for any calculation which we have learned how to do in this course. You are also allowed two sides of a $3'' \times 5''$ note card.
6. If you use graphs or tables to obtain an answer, be certain to include an explanation and sketch of the graph, and to write out the entries of the table that you use.
7. You must use the methods learned in this course to solve all problems.

Semester	Exam	Problem	Name	Points	Score
Winter 2012	3	3		12	
Fall 2013	3	2		11	
Winter 2014	3	4		10	
Fall 2014	3	10		10	
Winter 2015	3	1		10	
Winter 2016	3	2		12	
Winter 2017	3	3		9	
Winter 2018	2	6		12	
Winter 2013	3	9		14	
Total				100	

Recommended time (based on points): 117 minutes

3. [12 points]

a. [6 points] State whether each of the following series converges or diverges. Indicate which test you use to decide. Show all of your work to receive full credit.

1. $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$

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

b. [6 points] Decide whether each of the following series converges absolutely, converges conditionally or diverges. Circle your answer. No justification required.

1. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n\sqrt{n^2+1}}{n^2+n+8}$

Converges absolutely Converges conditionally Diverges

2. $\displaystyle\sum_{n=0}^{\infty} \frac{(-2)^{3n}}{5^n}$

Converges absolutely Converges conditionally Diverges

2. [11 points] Determine the convergence or divergence of the following series. In parts (a) and (b), support your answers by stating and properly justifying any test(s), facts or computations you use to prove convergence or divergence. Circle your final answer. Show all your work.

a. [3 points] $\displaystyle\sum_{n=1}^{\infty} \frac{9n}{e^{-n}+n}$ CONVERGES DIVERGES

b. [4 points] $\displaystyle\sum_{n=2}^{\infty} \frac{4}{n(\ln n)^2}$. CONVERGES DIVERGES

c. [4 points] Let r be a real number. For which values of r is the series $\displaystyle\sum_{n=1}^{\infty}(-1)^n \frac{n^2}{n^r+4}$ absolutely convergent? Conditionally convergent? No justification is required.

Absolutely convergent if : ____________________

Conditionally convergent if : ____________________

4. [10 points] Determine whether the following series converge or diverge. Show all of your work and justify your answer.

a. [5 points] $\displaystyle\sum_{n=1}^{\infty} \frac{8^n + 10^n}{9^n}$

b. [5 points] $\displaystyle\sum_{n=4}^{\infty} \frac{1}{n^3 + n^2 \cos(n)}$

10. [10 points] Determine whether the following series converge or diverge. Justify your answers.

a. [5 points] $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n \ln(n)}{n}$

b. [5 points] $\displaystyle\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^3+2}}$

1. [10 points] Show that the following series converges. Also, determine whether the series converges conditionally or converges absolutely. Circle the appropriate answer below. **You must show all your work and indicate any theorems you use to show convergence and to determine the type of convergence**.

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

CONVERGES CONDITIONALLY CONVERGES ABSOLUTELY

2. [12 points] In this problem **you must give full evidence supporting your answer, showing all your work and indicating any theorems about series you use.**

a. [7 points] Show that the following series **converges**. Does it converge conditionally or absolutely? Justify.

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

b. [5 points] Determine whether the following series converges or diverges:

$$\sum_{n=2}^{\infty} \frac{1}{n \ln n}$$

3. [9 points] In this problem you must give full evidence supporting your answer, showing all your work and indicating any theorems or tests about series you use. (Remark: You **cannot** use any results about convergence from the team homework without justification.)

a. [4 points] Determine whether the series below converges or diverges, and circle your answer clearly. Justify your answer as described above.

$$\sum_{n=1}^{\infty} \sin\left(\frac{1}{\sqrt{n}}\right)$$

Converges **Diverges**

b. [5 points] Determine if the following infinite series converges absolutely, converges conditionally, or diverges, and circle your answer clearly. Justify your answer as described above.

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

Converges Absolutely **Converges Conditionally** **Diverges**

6. [12 points] Determine whether the following series converge or diverge.
Fully justify your answer. Show all work and indicate any convergence tests used.

a. [6 points] $\displaystyle\sum_{n=1}^{\infty} \frac{n^2 + n\cos(n)}{\sqrt{n^8 - n + 1}}$ **Converges** **Diverges**

Justification:

b. [6 points] $\displaystyle\sum_{n=0}^{\infty} \frac{\sin(n)}{e^n}$ **Converges** **Diverges**

Justification:

9. [14 points] Determine the convergence or divergence of the following series. In questions (**a**) and (**b**) you need to support your answers by stating and properly justifying the use of the test(s) or facts you used to prove the convergence or divergence of the series. Circle your answer. Show all your work.

a. [4 points] $\displaystyle\sum_{n=1}^{\infty} \frac{2n}{\sqrt{n^5+1}}$ Converges Diverges

b. [4 points] $\displaystyle\sum_{n=1}^{\infty} n^2 e^{-n^3}$ Converges Diverges

c. [6 points] Determine if the following series converge absolutely, conditionally or diverge. Circle your answers. No justification is required.

a). $\displaystyle\sum_{n=1}^{\infty} \frac{\sin(3n)}{n^6+1}$

Converges absolutely Converges conditionally Diverges

b). $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{3n+1}$

Converges absolutely Converges conditionally Diverges