Math 116 — Practice for Exam 3

Generated November 1, 2017

Name: ______________________________

Instructor: ______________________ Section Number: __________

1. This exam has 6 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 2010	3	3		12	
Winter 2012	3	5		8	
Winter 2013	3	8		8	
Fall 2014	3	8		7	
Winter 2015	3	5		10	
Winter 2016	3	12		8	
Total				53	

Recommended time (based on points): 64 minutes

3. [12 points] For each of the following series, determine the interval of convergence and write it on the space provided to the right of the series. Be sure to show all appropriate work to justify your answer.

a. [6 points] $\sum_{n=1}^{\infty} \frac{(-1)^n (x-2)^n}{n}$ ________________________

b. [6 points] $\sum_{n=1}^{\infty} \frac{n! x^n}{n^{10}}$ ________________________

5. [8 points] Consider

$$\sum_{n=1}^{\infty} \frac{n}{4^n(n+1)}\, x^{2n}.$$

a. [2 points] Does the series converge for $x = 2$? Justify your answer.

b. [2 points] Based only on your answer from part **a**, what can you say about R, the radius of convergence of the series? Circle your answer.

c. [4 points] Find the interval of convergence of the series.

8. [8 points] Consider the power series

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

In the following questions, 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. Show all your work.

a. [2 points] Does the series converge or diverge at $x = 3$?

b. [2 points] What does your answer from part (**a**) imply about the radius of convergence of the series?

c. [4 points] Find the interval of convergence of the power series.

8. [7 points] Consider the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x+2)^n}{3^n n}$.

a. [2 points] At which x-value is the interval of convergence of this power series centered?

b. [5 points] The radius of convergence for the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x+2)^n}{3^n n}$ is 3. Find the interval of convergence for this power series. Thoroughly justify your answer.

9. [5 points] Find the radius of convergence for the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2} x^{2n}$

5. [10 points]

a. [5 points] Determine the **radius** of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{(-1)^n (x-5)^{4n}}{n^5 (16)^n}.$$

The radius of convergence is ______________

b. [5 points] The power series $\displaystyle\sum_{n=0}^{\infty} \frac{(n+2)x^n}{n^4+1}$ has radius of convergence 1. Determine the **interval** of convergence for this power series.

The interval of convergence is ______________

12. [8 points] Suppose that the power series $\sum_{n=0}^{\infty} a_n(x-4)^n$ converges when $x = 0$ and diverges when $x = 9$. In this problem, you do not need to show your work.

a. [4 points] Which of the following could be the interval of convergence? Circle **all** that apply.

$[0, 8]$ $[0, 7]$ $(-1, 9)$ $(-2, 10)$ $(0, 8]$

b. [2 points] The limit of the sequence a_n is 0.

ALWAYS **SOMETIMES** **NEVER**

c. [2 points] The series $\sum_{n=0}^{\infty} (-5)^n a_n$ converges.

ALWAYS **SOMETIMES** **NEVER**