

## MATH 116 — PRACTICE FOR EXAM 2

Generated November 1, 2020

NAME: \_\_\_\_\_

INSTRUCTOR: \_\_\_\_\_ SECTION NUMBER: \_\_\_\_\_

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1. This exam has 2 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 2013	3	9		14	
Fall 2014	3	4	robot army	8	
Total				22	

**Recommended time (based on points): 26 minutes**

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]  $\sum_{n=1}^{\infty} \frac{2n}{\sqrt{n^5 + 1}}$                       Converges                      Diverges

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

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

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

Converges absolutely                      Converges conditionally                      Diverges

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

Converges absolutely                      Converges conditionally                      Diverges

4. [8 points] Franklin's robots start building more robots to replace their deactivated comrades. The initial number of robots in Franklin's army is 800. Each minute, the number of robots increases by 15%. At the end of each minute, you fire an EMP which immediately deactivates 50 robots.
- a. [3 points] Let  $R_n$  denote the number of active robots in Franklin's army immediately after the EMP is fired for the  $n$ -th time. Find  $R_1$  and  $R_2$ .
- b. [4 points] Find a closed form expression for  $R_n$  (i.e. evaluate any sums and solve any recursion).
- c. [1 point] Find  $\lim_{n \rightarrow \infty} R_n$ . No justification is necessary.