University of Connecticut
Department of Mathematics

Math 1132 — Exam 2 Practice — Fall 2024

Name: ______________________________

Signature: ______________________________

Read This First!

- Please read each question carefully. The point value of each question is indicated in the box preceding its statement.
- In all free-response questions, you will *only* receive credit by providing clear work using techniques learned in this class.
- No books, formula sheets, calculators, phones, smart watches, headphones, or other references are permitted.
- No personal scrap paper is allowed.

Practice Problems Notes

- The practice problems together are almost twice as long as the actual exam.
- Timed practice without notes is essential! Try some of these under exam conditions after you have had some time to study.
- The coverage in the practice problems is not exhaustive. Look through class notes, WebAssign, and quizzes as well.

Problem 1: Indicate the validity of each statement by entering True (T) or False (F) in the blank.

(i) ______ The geometric series $\sum_{n=1}^{\infty} 2\left(\frac{1}{3}\right)^{n-1}$ converges to 3.

(ii) ______ If the series $\sum_{n=1}^{\infty} a_n$ diverges, then the sequence a_n must diverge.

(iii) ______ The sequence $a_n = \frac{n^2}{e^n}$ has limit 0.

(iv) ______ The sequence $a_n = (-1)^n$ is bounded.

(v) ______ The partial sums of the series $\sum_{n=0}^{\infty} \frac{1}{2^n}$ are an increasing sequence.

(vi) ______ If we use the partial sum S_5 to approximate the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}$, the Alternating Series Remainder Estimate tells us that the remainder/error satisfies $|R_5| \leq \frac{1}{7}$.

(vii) ______ If $b_n > a_n > 0$ for all n and $\sum b_n$ diverges, then $\sum a_n$ must converge.

(viii) ______ The series $\sum_{n=1}^{\infty} \frac{3n-1}{5n+2}$ converges.

Problem 2: Determine whether $\sum_{n=0}^{\infty} \frac{n^5}{n!}$ converges or diverges. Please show all work and clearly indicate any test being used.

Problem 3: Determine whether $\sum_{n=1}^{\infty} \frac{\sqrt{n^2+5n}}{n^3}$ converges or diverges. Please show all work and clearly indicate any test being used.

Problem 4: Use the Integral Test (and check all conditions) to determine whether $\displaystyle\sum_{n=3}^{\infty} \frac{\ln(n)}{n}$ converges or diverges. Please show all work.

Problem 5: What is the smallest value of N for which the Alternating Series Remainder Estimate tells us the remainder R_N for the Nth partial sum of $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ satisfies $|R_N| \leq \dfrac{1}{10}$? Please show all work.

Problem 6: Determine whether $\displaystyle\sum_{n=2}^{\infty} \frac{n}{n^2 - 3}$ converges or diverges. Please show all work and clearly indicate any test being used.

Problem 7: Determine whether $\displaystyle\sum_{n=0}^{\infty} \frac{n!}{n^2 + 6^n}$ converges or diverges. Please show all work and clearly indicate any test being used.

Problem 8: Determine whether the series

$$\sum_{n=2}^{\infty}(-1)^n \frac{n}{\sqrt{n^4-1}}$$

is absolutely convergent, conditionally convergent, or divergent. Please show all work and clearly indicate any test being used.

Problem 9: Determine whether the series

$$\sum_{n=2}^{\infty}(-1)^n \frac{n^3}{n^5+6}$$

is absolutely convergent, conditionally convergent, or divergent. Please show all work and clearly indicate any test being used.

Problem 10: Determine whether $\sum_{n=1}^{\infty} \frac{n^2 7^n}{n!}$ converges or diverges. Please show all work and clearly indicate any test being used.