MATH 22 PRACTICE EXAM ON SERIES

Name:

Section:

Instructions:

(1) Books, notes, and calculators are not permitted.
(2) Simplify as instructed. On some problems, unsimplified correct answers will not receive full credit.
(3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following series converges?

A. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$.

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

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

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

E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Consider the series

$$\sum_{n=0}^{\infty} (-1)^n = 1 - 1 + 1 - 1 + \cdots .$$

Which of the following best describes the convergence or divergence of this series?

A. It diverges to $-\infty$.

B. It converges to 0.

C. It converges to $\frac{1}{2}$.

D. It diverges to ∞.

E. None of these.

Problem 3. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following statments best describes the relationship between the convergence of a sequence $(a_0, a_1, a_2, \dots)$ and the corresponding series $\sum_{n=0}^{\infty} a_n$?

A. If the sequence converges to 0, then the series converges to 0.

B. If the sequence converges to 0, then the series converges, but not necessarily to 0.

C. If the series converges, then the sequence converges to 0.

D. If the series converges, then the sequence converges, but not necessarily to 0.

E. None of these.

Problem 4. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Let $(a_0, a_1, a_2, \dots)$ be a sequence of positive numbers that converges to 1. What can we say about the sequence $(\ln(a_0), \ln(a_1), \ln(a_2), \dots,)$?

A. It converges to 0.

B. It converges to 1.

C. It converges, but not necessarily to 0 or 1.

D. It diverges to ∞.

E. None of these.

Problem 5. (15 pts.) Convert the repeating decimal $1.234\overline{567}$ into a fraction. Show your work and simplify your answer.

Problem 6. (15 pts.) Find a formula for each of the following sums. Simplify your answers.

(a) $\displaystyle\sum_{n=0}^{\infty}\left(-\frac{1}{6}\right)^n$.

(b) $\displaystyle\sum_{n=3}^{\infty}\left(-\frac{1}{6}\right)^n$.

(c) (a) $\displaystyle\sum_{n=23}^{\infty}\left(-\frac{1}{6}\right)^n$.

(d) (a) $\displaystyle\sum_{n=3}^{22}\left(-\frac{1}{6}\right)^n$.

Problem 7. (15 pts.) Find a formula for the sum

$$\sum_{n=2}^{\infty}\left(\frac{1}{\sqrt{n}}-\frac{1}{\sqrt{n+1}}\right),$$

and simplify your answer, or explain why the series diverges.

Problem 8. (15 pts.)

(a) Evaluate the limit

$$\lim_{n\to\infty} \sqrt{\frac{4n^n + 9n! + 16^n + 25n^2}{\ln(n) + 16n^n + 3n! + 144n^2}}$$

and simplify your answer, or explain why the limit does not exist.

(b) Evaluate the sum of the series

$$\sum_{n=2}^{\infty} \sqrt{\frac{4n^n + 9n! + 16^n + 25n^2}{\ln(n) + 16n^n + 3n! + 144n^2}}$$

and simplify your answer, or explain why the series diverges.

Problem 9. (15 pts.) Find a formula for the sum

$$\frac{3}{2}+\frac{3}{4}+\frac{3}{6}+\frac{3}{8}\cdots$$

and simplify your answer, or explain why the series diverges.