

Math 202H
Review for Exam 3
Sections 8.7 - 9.6

Problem 1 Evaluate $\lim_{x \rightarrow 1^+} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$

Problem 2 Evaluate $\int_0^2 \frac{1}{x^3} dx$.

Problem 3 Evaluate $\int_0^\infty \frac{1}{\sqrt{x}(x+1)} dx$

Problem 4 Consider the sequence whose n^{th} term is $a_n = \frac{n^2}{2^n - 1}$.

1. Determine upper and lower bounds for the terms of the sequence.
2. Show that the sequence is eventually monotonic.
3. Determine the convergent value of the sequence.

Problem 5 Determine if the following series is convergent or divergent. If convergent, determine its convergent value.

$$\sum_{n=4}^{\infty} \left(\frac{1}{2} \right)^n.$$

Problem 6 Determine if the following series is convergent or divergent. If convergent, determine its convergent value.

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

Problem 7 Determine whether the following series converges or diverges.

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

Problem 8 Determine the convergence or divergence of

$$\sum_{n=4}^{\infty} \frac{1}{2 + \sqrt{n}}.$$

Problem 9 Determine the convergence or divergence of

$$\sum_{n=4}^{\infty} \frac{n2^n}{4n^3 + 1}.$$

Problem 10 Determine the convergence or divergence of

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

Problem 11 Determine the convergence or divergence of

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

Problem 12 Show that the following series is conditionally convergent.

$$\sum_{n=4}^{\infty} \frac{(-1)^n}{\ln(n+1)}.$$

Problem 13 Determine whether the following series converges or diverges.

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

Problem 14 Determine the convergence or divergence of

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