
Review Topics for Exam 3

MATH 136, SPRING 2008

- Sequences:
 - Convergence and divergence for sequences $\{a_n\}$.
 - Monotone sequences
 - Practical methods for finding limits of sequences (l'Hopital, squeezing theorem)
- Series
 - Geometric series, harmonic series
 - Series with positive terms (Integral test, comparison test, limit comparison)
 - Alternating series test
 - Absolute convergence test
 - Ratio test and root test
- Power Series
 - Finding radius of convergence and interval of convergence
 - Representing functions as power series
 - Integrating and differentiating power series
 - Maclaurin and Taylor series

Sample Exam 3

WORD OF CAUTION! In each problem, you need to provide reasonable explanation for your answer in order to get credit for your work!!!

- **Problem 1**

Determine whether the sequence below is convergent or divergent. If convergent, find its limit.

$$a_n = \frac{\ln n}{\sqrt{n}}, \quad n \geq 1$$

- **Problem 2**

Test the series for convergence or divergence. Explain!

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

• **Problem 3**

Determine whether the series is absolutely convergent, conditionally convergent or divergent.

$$\sum_{n=1}^{\infty} \frac{\sin 3n}{2^n}$$

• **Problem 4**

Using the integral test, determine whether the series

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

is convergent or divergent.

• **Problem 5**

Find the sum of the series

$$\sum_{n=1}^{\infty} \frac{2^{2n+1}}{5^n}$$

• **Problem 6**

Find the radius of convergence and interval of convergence of the series

$$\sum_{n=1}^{\infty} \frac{(x+2)^n}{n4^n}$$

• **Problem 7**

(a) Find a power series representation for $f(x) = \arctan(x^2)$ and determine its radius of convergence.

(b) Express the indefinite integral below as a power series.

$$\int \frac{\arctan(x^2)}{x^2} dx$$

• **Problem 8**

Find the Taylor series for the function $f(x) = \ln x$, centered at $a = 2$. Determine its radius of convergence and interval of convergence.