

MATH 3283W. Sequences, Series, and Foundations:
Writing Intensive.
Midterm Exam #2. April 16, 2009.

60 points are distributed between 5 problems, 12 points each.
You have 50 minutes to work on these problems.
No books, notes, and calculators are permitted.

Determine whether or not each of the following three series is convergent or divergent:

#1.

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

#2.

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

#3.

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

#4. Show that the following series convergent, and find its sum:

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

#5. Find the coefficients a_n in the power series

$$\frac{1}{1 + x - 2x^2} = \sum_{n=0}^{\infty} a_n x^n,$$

and determine its radius of convergence.

Hint:

$$\frac{1}{a - x} = \sum_{n=0}^{\infty} \frac{x^n}{a^{n+1}} \quad \text{for } |x| < |a|.$$