

MATH 1953 Written Homework 7 (due Wednesday, May 22nd at the BEGINNING of class!)

Please write solutions to these problems on separate sheet(s) of paper (i.e. don't print and write on this assignment.)

1. The infinite series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n} = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} \dots$ is called the **alternating harmonic series**.

(a) Explain why the alternating harmonic series converges to a limit.

(b) Use the techniques discussed in class to find an estimate of the value of the alternating harmonic series which is within 0.1 of the true value.

(c) Mysteriously, the value of this series is actually $\ln 2$. Check that your answer to part (b) is actually within 0.1 of $\ln 2$.

2. The alternating harmonic series can be thought of as having a “positive part” $1 + \frac{1}{3} + \frac{1}{5} + \dots$ and a “negative part” $-\frac{1}{2} - \frac{1}{4} - \frac{1}{6} - \dots$. Write each of these using summation notation, and decide whether they converge or diverge.

3. Use the Ratio Test to decide whether the series $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$ converges or diverges.