Math 4001-5001: HW3

Due Friday, 9/20/2019

Problem 3.1
Provide the missing proof of the first statement in Theorem 3.37.

Problem 3.2
Prove the following statement in Rudin, page 68: Whenever the ratio test shows convergence, the root test does too; whenever the root test is inconclusive, the ratio test is too.

Problem 3.3
Consider the following series

$$\frac{1}{3}+\frac{1}{5}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{3^3}+\frac{1}{5^3}+\cdots$$

What conclusion do you get by applying

a. Ratio Test?

b. Root Test?

Problem 3.4
Discuss the convergence or divergence of the following series (you can assume all the series start at $n = 1$):

a. $\sum a_n$, $a_n = \frac{(2n+1)^n}{n^{2n}}$

b. $\sum a_n$, $a_n = \log \frac{n}{3n+1}$

c. $\sum a_n$, $a_n = \frac{e^n n^3}{(n+1)!}$