MA114 Summer II 2017
Exam 2 Review
7/12/17

1. Determine whether the following series are absolutely convergent, conditionally convergent, or divergent. Show your work.

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

b) $\sum_{k=1}^{\infty} \frac{k \ln k}{(k+1)^3}$

c) $\sum_{n=1}^{\infty} \frac{\ln n}{n}$,

d) $\sum_{n=1}^{\infty} \frac{3^n n^2}{n!}$,

e) $\sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \cdot \ldots \cdot (2n-1)}{2 \cdot 5 \cdot 8 \cdot \ldots \cdot (3n-1)}$,

f) $\sum_{n=1}^{\infty} \left(\frac{1}{n^3} + \frac{1}{3^n} \right)$,

g) $\sum_{k=1}^{\infty} k^5 \sqrt[3]{k^{-21}}$,

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

2.

a) What does the integral test tell us about $\sum_{n=1}^{\infty} |\cos n| + 1/n$?

b) What is the limit of the convergent geometric sequence $\sum_{n=1}^{\infty} r^n$?

c) True or false: if $\lim_{n\to\infty} a_n = 0$, then $\sum a_n$ converges.

3. Find the limit of the following sequences or show that they diverge.

a) $a_n = \frac{(-1)^n}{2\sqrt{n}}$

b) $a_n = \frac{4^n}{1+9^n}$

c) $a_n = \frac{n^4}{n^3-2n}$

d) $a_n = \frac{3+5n^2}{n+n^2}$

4. Find power series representations and the associated radius of convergence for $\frac{x^3}{5+x^2}$, $\arctan(x)$ and $\frac{2}{(1-x)^2}$ given that $\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$ on $(-1,1)$.

5. Find the average values of $f(x) = \frac{\sin(\pi/x)}{x^2}$ on $[1,2]$ and $g(x) = x^n$ for some constant $n \geq 0$ on $[0,1]$.