LUTIONS

/ 25

30 minutes. No aids (book, notes, calculator, internet, etc.) are permitted. Show all work and use proper notation for full credit. Put answers in reasonably-simplified form. 25 points possible.

1. [8 points] Do the series converge absolutely, converge conditionally, or diverge? Show your work, identify tests you used, and circle one answer.

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

$$b_n = \frac{1}{\sqrt{n}}$$

but
$$\sum_{N=1}^{\infty} \frac{1}{\sqrt{n}} = \sum_{N=1}^{\infty} \frac{1}{\sqrt{n}} \times \text{dwinger} \quad (p = \frac{1}{2})$$

CONVERGES ABSOLUTELY

DIVERGES

$$\mathbf{b.} \ \sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n!}$$

$$\sum_{N=1}^{\infty} |q_N| = \sum_{N=1}^{\infty} \frac{1}{N!}$$

$$\frac{1}{N!} = \frac{1}{N^2}$$

by companion test
(p=2)



CONVERGES CONDITIONALLY

DIVERGES

2. [8 points] Use the ratio or root test to determine whether the series converges or diverges. Show ratio test also works time your work.

$$\mathbf{a.} \ \sum_{n=0}^{\infty} \frac{n2^n}{3^n}$$

$$\sqrt[n]{\frac{n^2}{3^n}}$$

$$=$$
 $\frac{1}{n}$

$$=\frac{1.2}{3}=\frac{2}{3}=p<1$$

b. $\sum_{k=1}^{\infty} \frac{(-1)^k x^k}{k!}$ where x is any real number

ratio test:
$$\lim_{k \to \infty} \frac{\left| \frac{(-1)^{k+1} \times k+1}{(k+1)!} \right|}{\left| \frac{(-1)^{k} \times k+1}{(k+1)!} \right|} = \lim_{k \to \infty} \frac{|x|^{k+1}}{(k+1)!} |x|^{k}$$

$$=\lim_{k\to\infty}\frac{|x|}{(k+1)}\frac{k!}{k!}=\lim_{k\to\infty}\frac{1\times 1}{k+1}=0=p$$



3. [9 points] Use any test to determine whether the series converges or diverges. Show your work.

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

 $\lim_{N\to\infty}\frac{n}{1}\left(\frac{1}{1+\ln n}\right)^n=\lim_{N\to\infty}\frac{1}{1+\ln n}$

SO Converges

b. $\sum_{r=1}^{\infty} n^{3/2}$

 $\mathbf{c.} \ \sum_{n=1}^{\infty} (-1)^{n+1} \left(\sqrt{n+1} - \sqrt{n} \right)$

Math 252 (Bueler): Quiz 9

4 April 2024

Consider the alternating series $S = \sum_{n=2}^{\infty} \frac{(-1)^n}{\ln(n)}$. (It is conditionally Extra Credit. [1 point] convergent.) How many terms N are needed so that the partial sum $S_N = \sum_{n=2}^N \frac{(-1)^n}{\ln(n)}$ is within 0.01 of the correct value *S*?

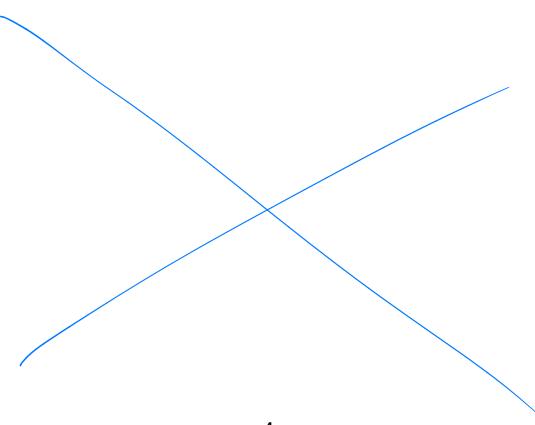
The correct value S?

$$|R_N| \stackrel{?}{=} b_{N+1} = \frac{1}{b_N(N+1)} \stackrel{?}{=} 0.07$$

$$|C_N(N+1)| \stackrel{?}{=} \frac{1}{0.01} = 100$$

$$N+1 \ge e^{100}$$

ridiculously large number of terms needed, since by



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