Quiz 5 **Calculus 1** **11/21/2005**

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Determine whether the series $\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n\ln n}$ converges or diverges.

A.S.T

decrease?

$\frac{1}{n\ln n} > \frac{1}{(n+1)(\ln(n+1))}$

$\frac{1}{n\ln n} > \frac{1}{n\ln(n+1) + \ln(n+1)}$

$n\ln(n+1) + \ln(n+1) > n\ln n$

$\ln(n+1)(n+1) > n\ln n$

$\frac{\ln(n+1)(n+1)}{\ln n} > n$

$(n+1) > n$

$1 > 0$

$1 > 0$

$n+1 > n$

$\ln(n+1) > \ln n$

$+$

$n+1 > n$

so

$\ln(n+1)\cdot(n+1) > n\ln n$

$\frac{1}{n\ln n} > \frac{1}{\ln(n+1)\cdot(n+1)}$

it is decreasing so in converges because its decreasing and $\lim_{n\to\infty} = 0$.

Great!

lim = 0? $\frac{1}{n\ln n}$ $\lim_{n\to\infty}\frac{1}{n\ln n} = 0$ so it's $\lim_{n\to\infty}$ is 0

2. Determine whether the series $\sum_{n=1}^{\infty} \frac{1}{(2n)!}$ converges or diverges.

$\lim_{n\to\infty}\left|\frac{a_{n+1}}{a_n}\right| = L > 1$ or ∞, diverges
$L < 1$, converges absolutely

can get rid of "| |" because all positives

$\lim_{n\to\infty}\left|\frac{\frac{1}{(2(n+1))!}}{\frac{1}{(2n)!}}\right| = \lim_{n\to\infty}\left|\frac{\frac{1}{(2n+2)!}}{\frac{1}{(2n)!}}\right| = \lim_{n\to\infty}\frac{1}{(2n+2)!}\cdot\frac{(2n)!}{1} = \lim_{n\to\infty}\frac{1}{(2n+2)(2n+1)\cancel{(2n)!}}\cdot\frac{\cancel{(2n)!}}{1}$

$= \lim_{n\to\infty}\frac{1}{(2n+2)(2n+1)} = 0$ $0 < 1$ so,

Nice!

Therefore, by the Rat. Test, it converges absolutely.