LAST NAME: FIRST NAME: KEY

Math 65B - Summer 2016

Quiz 10: Thursday July 14, 2016

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1. (1 point) Determine whether the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{(2n)!}{2^n(n!)}$$

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

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

$$= \lim_{n\to\infty} \frac{\cancel{(2n+2)}(2n+1)}{\cancel{(2n+2)}}$$

$$= \lim_{n\to\infty} 2n+1 = \infty$$

$\Rightarrow$ by Ratio test, series diverges

Please, show all work.

2. (1 point) Determine whether the series converges or diverges.

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

Alternating Series Test.

① $\lim_{n\to\infty} b_n = \lim_{n\to\infty} \frac{1}{\ln(n)} = 0$ ✓

② Show $b_{n+1} < b_n$

$\ln(n) < \ln(n+1)$ since $\ln$ is an increasing function

$\Rightarrow \frac{1}{\ln(n+1)} < \frac{1}{\ln(n)}$ ✓

So by Alternating Series Test,

$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\ln(n)}$ converges

Please, show all work.