

Quiz 7

NAME: _____

RECITATION: (Mon8 Mon9) Wed8 Wed9

1. Does the following series diverge or converge?

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

Root TEST: $\sqrt[n]{a_n} = \sqrt[n]{\frac{\sqrt{n^n}}{(n+1)^n}} = \frac{\sqrt{n}}{n+1}$

$$\lim_{n \rightarrow \infty} \sqrt[n]{a_n} = \lim_{n \rightarrow \infty} \frac{\sqrt{n}}{n+1} = \lim_{n \rightarrow \infty} \frac{\sqrt{\frac{1}{n}}}{1 + \frac{1}{n}} = 0 < 1$$

CONVERGES

2. Does the following series diverge or converge?

$$\sum_{n=1}^{\infty} \frac{(n+1)!}{(n!)3^n}$$

RATIO TEST: $a_n = \frac{(n+1)!}{n!3^n} = \frac{n+1}{3^n}$

$$\frac{a_{n+1}}{a_n} = \frac{\frac{n+2}{3^{n+1}}}{\frac{n+1}{3^n}} = \frac{n+2}{3^{n+1}} \cdot \frac{3^n}{n+1}$$

$$= \frac{1}{3} \frac{n+2}{n+1}$$

$$= \frac{1}{3} \frac{1+\frac{2}{n}}{1+\frac{1}{n}} \rightarrow \frac{1}{3} < 1$$

CONVERGES