Calc III
Written Homework 8

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1

When the root test is done on the second sum, $\sum_{n=1}^{\infty} na_n$, the n recieve the exponent $\frac{1}{n}$, from the $\sqrt[n]{}$. Because $\lim_{n\to\infty} n^{\frac{1}{n}}$ is 1, this second sum will have the same convergence as the original sum.

2

- $\sum_{n=1}^{\infty} \frac{n}{n^3+1}$ I would use convergence, against $\frac{n}{n^3} = \frac{1}{n^2}$.
- $\sum_{n=1}^{\infty} \frac{n^2+1}{n^3+1}$ I would use the Limit Comparison Test, against $\frac{n^2}{n^3}$.
- $\sum_{n=1}^{\infty} \frac{n^3}{5^n}$ I would use the Root Test.
- $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}$ I would use the Alternating Series Test
- $\sum_{n=1}^{\infty} \frac{1}{n\sqrt{nln(n)}}$ I would use the Integral test (u sub, ln x and $\frac{1}{x}$)
- $\sum_{n=1}^{\infty} ln(\frac{n}{3n+1})$ convergence, against $\frac{n}{3n}$
- $\sum_{n=1}^{\infty} \frac{cos3n}{1+(1.2)^2}$ I would use Limit Comparison test, with $((\frac{1}{1.2})^n)$
- $\sum_{n=1}^{\infty} \frac{n^{2n}}{(1+2n^2)^n}$ I would use the root test
- $\sum_{n=1}^{\infty} \frac{1*3*5...(2n-1)}{5^n*n!}$ I would use the Ratio Test

3

$$\sum_{n=1}^{\infty} \frac{n^n}{n!} x^n$$

Ratio Test

From this point on, there is absolute value around the entire thing.

$$\frac{\frac{x^{n+1}(n+1)^{n+1}}{(n+1)n!}}{\frac{x^n n^n}{n!}}$$

$$= \frac{x^{n+1}(n+1)^{n+1}}{x^n n^n (n+1)}$$

$$= \frac{x(n+1)^n}{n^n}$$

Not quite sure where to go from here