n^{th}
??
$\sum_{n=1}^{\infty} a_n$
$\lim_{n\to\infty} a_n =$
0
$\{a_n\}$
$\lim_{n\to\infty} 1/n =$
0
$\sum_{n=1}^{\infty} \frac{1}{n}$
$\{1/n\}$
Ratio Test
$_testRatioTestLet\{_n\}$
$\lim_{n\to\infty} \frac{a_{n+1}}{a_n} =$
L
$L <$
1
$\sum_{n=1}^{\infty} a_n$
$L >$
1
$L =$
∞
$\sum_{n=1}^{\infty} a_n$
$L =$
1
$\lim_{n\to\infty} \frac{a_{n+1}}{a_n} =$
$L <$
1
n
$\{a_n\}$
$_ratio1ApplyingtheRatioTestUsetheRatioTesttodeterminetheconvergenceofthefollowingseries:$
$1. \sum_{n=1}^{\infty} \frac{2^n}{n!} 2. \sum_{n=1}^{\infty} \frac{3^n}{n^3} 3. \sum_{n=1}^{\infty} \frac{1}{n^2+1}.$
$\sum_{n=1}^{\infty} \frac{2^n}{n!}$
$\lim_{n\to\infty} \frac{2^{n+1}/(n+1)!}{2^n/n!} =$
$\lim_{n\to\infty} \frac{2^{n+1}n!}{2^n(n+1)!}$
$=$
$\lim_{n\to\infty} \frac{2}{n+1}$
$=$
$0.$
$0 <$
1
$\sum_{n=1}^{\infty} \frac{2^n}{n!}$
$\sum_{n=1}^{\infty} \frac{3^n}{n^3}$
$\lim_{n\to\infty} \frac{3^{n+1}/(n+1)^3}{3^n/n^3} =$
$\lim_{n\to\infty} \frac{3^{n+1}n^3}{3^n(n+1)^3}$
$=$
$\lim_{n\to\infty} \frac{3n^3}{(n+1)^3}$
$=$
$3.$
$3 >$
1
$\sum_{n=1}^{\infty} \frac{3^n}{n^3}$
$\sum_{n=1}^{\infty} \frac{1}{n^2+1}$
$\lim_{n\to\infty} \frac{1/\left((n+1)^2+1\right)}{1/(n^2+1)} =$
$\lim_{n\to\infty} \frac{n^2+1}{(n+1)^2+1}$
$=$
$1.$
$\sum_{n=1}^{\infty} \frac{1}{n^2}$
only
$_ratio2ApplyingtheRatioTestDeterminetheconvergenceof\sum_{n=1}^{\infty} \frac{n!n!}{(2n)!}$
$(2n)!$
$2n!$
$n =$
4
$8! =$
$8\cdot$
$7\cdot$
$\cdots$
$2\cdot$
$1 =$
$40,320$
$2(4\cdot$
$3\cdot$
$2\cdot$
$1) =$
48
$\lim_{n\to\infty} \frac{(n+1)!(n+1)!/\left(2(n+1)\right)!}{n!n!/(2n)!} =$
$\lim_{n\to\infty} \frac{(n+1)!(n+1)!(2n)!}{n!n!(2n+2)!} Notingthat$