Math 128 : Calculus 2 for the Sciences **Winter 2016**

Lecture 25: March 7, 2016

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25.1 Harmonic Series

In general : $S_{2^n} > 1 + \frac{n}{2}$
Therefore, $\lim_{n\to\infty} S_{2^n} = \infty \implies \lim_{n\to\infty} S_n = \infty$ Therefore, $\{s_n\}$, the sequence of a partial sum diverges and thus $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges

25.2 Divergence Test

If $\lim_{n\to\infty} a_n \neq 0$ or DNE, then the series $\sum_{n=1}^{\infty} a_n$ diverges
If the limit does equal zero, we cannot conclude anything

25.3 Integral Test

Theorem 25.1 *Suppose the terms in the series $\sum_{n=1}^{\infty} a_n$ are denoted by $a_n = f(x)$ and $f(x)$ is continuous, positive, and decreasing on $x \geq 1$*
Then $\sum_{n=1}^{\infty} a_n$ converges if and only if the improper integral $\int_1^{\infty} f(x)dx$ converges

Notes : Despite this link, the values are not equal

Theorem 25.2 *The p-series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is convergent if $p > 1$ and divergent if $p \neq 1$*

End of Lecture Notes
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