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

Lecture 29: March 16, 2016

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29.1 Ratio Test Con't

Notes:

- Works well when a_n contains $n!$ or $(constant)^n$
- Does not work well if a_n is rational
- Does not require all positive terms
- The term that goes in the numerator matters

29.2 Power Series

A power series is an infinite series of the form

$$\sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \dots$$

where x is a variable and c's are constants, called the coefficients of the series.
More generally, a power series centered at a or about a is

$$\sum_{n=0}^{\infty} c_n (x-a)^n = c_0 c_1 (x-a) + c_2 (x-a)^2 + c_3 (x-a)^3 + \dots$$

Also, we know the geometric series $\sum x^{n-1}$ is a power series which diverges when $|x| \leq 1$
So this tells that $\sum x^{n-1} = \frac{1}{1-x}$ on the interval (-1,1)

We say that (-1,1) is the interval of convergence and R = 1 is the radius of convergence for the series

For any power series we are often interested in determining for which values of x the power series converges. We can use the ratio test to do so.

Example 29.1 *For what values of x does* $\sum_{n=0}^{\infty} \frac{1}{n+1}(x-2)^n$ *converge?*

- *Using the ratio test we get* $\lim_{n\to\infty} = |x-2|$
- *It converges absolutely if* $|x-2| < 2 \iff 1 < x < 3$
- *It diverges if* $|x-2| > 1 \iff x > 3 or x < 1$

- *At* $x = 1$*, the series converges and At* $x = 3$*, the series diverges*
- *So, the power series converges for* $1 \leq x < 3$

Thus,
The Interval of convergence is [1,3)
The Radius of convergence is 1
The center of convergence is 2

End of Lecture Notes
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