AP Calculus BC
Unit 10 – Sequences & Series (Part 2)

Day 5 Notes: Geometric Power Series

We can write a power series for some functions in the form of a geometric series $\sum_{n=0}^{\infty} a r^n = \frac{a}{1-r}$, where $|r| < 1$. We may have to manipulate $f(x)$ to put it in the form $\frac{a}{1-r}$.

Examples:

1. Write a geometric power series centered at $c = 0$ for $f(x) = \frac{3}{2x-1}$.

2. Find a geometric power series centered at $c = -2$ for $f(x) = \frac{3}{4-x}$.

   ****Take care of the center first!**

3. Write a geometric power series centered at $c = 0$ for $f(x) = \frac{4x-7}{2x^2+3x-2}$.

Convergence of Geometric Power Series

Let $\sum_{n=0}^{\infty} a r^n$ be a geometric power series.

- A geometric series will converge when $|r| < 1$.
- If a geometric series is centered at $x = c$ and the radius of convergence is R, the interval of convergence is $(c - R, c + R)$.
- A geometric series will never converge at the endpoints of the interval of convergence.

Examples:

4. Find a power series for $f(x) = \frac{4}{3x+2}$ centered at c = 2. Then find the interval of convergence.

5. Write a geometric power series centered at $c = 0$ for $f(x) = \frac{3x-1}{x^2-1}$. Then find the interval of convergence.

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Unit 10 – Day 5 – Assignment

Find a power series for the function, centered at c, and determine the interval of convergence.

1) $f(x)=\frac{4}{5-x}, c=-2$	**2)** $f(x)=\frac{3}{2x-1}, c=2$
3) $f(x)=\frac{1}{2x-5}, c=0$	**4)** $f(x)=\frac{4}{3x+2}, c=2$

5) $f(x) = \dfrac{3x}{x^2 + x - 2}, c = 0$

6) $f(x) = \dfrac{2}{1 - x^2}, c = 0$