MAT137 - Calculus with proofs

- Assignment 9 due on March 25
- Assignment 10 due on April 8
- Test 5 opens on April 22

- Today: Ratio Test

- Wednesday: Power series **(Watch Videos 14.1, 14.2)**

Quick review: Convergent or divergent?

1. $\displaystyle\sum_{n}^{\infty}(1.1)^n$

2. $\displaystyle\sum_{n}^{\infty}(0.9)^n$

3. $\displaystyle\sum_{n}^{\infty}\frac{1}{n^{1.1}}$

4. $\displaystyle\sum_{n}^{\infty}\frac{1}{n^{0.9}}$

5. $\displaystyle\sum_{n}^{\infty}\frac{(-1)^n}{\ln n}$

6. $\displaystyle\sum_{n}^{\infty}\frac{(-1)^n}{e^{1/n}}$

7. $\displaystyle\sum_{n}^{\infty}\frac{n^3+n^2+11}{n^4+2n-3}$

8. $\displaystyle\sum_{n}^{\infty}\frac{\sqrt{n^5+2n+16}}{n^4-11n+7}$

Ratio Test: Convergent or divergent?

Use Ratio Test to decide which series are convergent.

1. $\displaystyle\sum_{n=1}^{\infty} \frac{3^n}{n!}$
2. $\displaystyle\sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2\, 3^{n+1}}$
3. $\displaystyle\sum_{n=2}^{\infty} \frac{n!}{n^n}$
4. $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\ln n}$

Challenge

We want to calculate the value of $\quad A = \sum_{n=0}^{\infty} \frac{1}{3^n}, \quad B = \sum_{n=1}^{\infty} \frac{n}{3^n}.$

Let $f(x) = \dfrac{1}{1-x}$.

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1. Recall that for $|x| < 1$

   $$f(x) \ = \ \sum_{n=0}^{\infty} x^n \ = \ 1 + x + x^2 + x^3 + x^4 + \dots$$

   Use it to compute A.

2. Pretend you can take derivatives of infinite sums the way you take them of finite sums.

   $$f'(x) = \dots$$

   Use it to compute B.