

The alternating harmonic series is

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n} = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \cdots$$

1. Does the alternating harmonic series converge? Why or why not?
2. Use your calculator to work out the 10th partial sum of the alternating harmonic series.
3. For which x does the series $1 - x + x^2 - x^3 + \cdots$ converge?
4. What does the series $1 - x + x^2 - x^3 + \cdots$ converge to? (Hint: it's a geometric series).
Call this function $f(x)$.
5. Integrate each term of the series $1 - x + x^2 - x^3 + \cdots$ to get a new series.
For which x does this new series converge?
6. Integrate $f(x)$ to get a new function.
7. Plug in $x = 1$ to your series and to $f(x)$.
What does the alternating harmonic series converge to?