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?