

Let  $P(x)$  be the power series

$$1 - \frac{x}{2} + \frac{x^2}{3} - \frac{x^3}{4} + \cdots = \sum_{k=0}^{\infty} \frac{(-x)^k}{k+1}$$

1. Does the series converge when  $x = 1$ ?
2. Does the series converge when  $x = -1$ ?
3. Does the series converge when  $x = \frac{1}{2}$ ?
4. For what values of  $x$  does  $P(x)$  converge absolutely?  
(Remember: Try the Ratio Test)