Consider the function \( f(x) \) defined by the power series:

\[
    f(x) = \sum_{n=1}^{\infty} \frac{1}{n}(x - 1)^n.
\]

a). Determine the interval where \( f(x) \) is defined. (In other words, find the interval of convergence for the power series). (3')

b). Determine where the series converges absolutely, conv. conditionally and diverges. (2')

c). Find the power series form for \( f'(x) \) (1 pt) and a closed form for \( f'(x) \) (2')

d). Find a closed expression for \( f(x) \) (2')
Bonus: We know it’s impossible to get a closed form of \( \int_0^x e^{-t^2} dt \). However, we can actually get a power series expression for it.

a). Get this power series expression. (3') (Hint: Get the Maclaurin series of \( e^{-t^2} \))

b). Get an approximation for \( I = \int_0^1 e^{-t^2} dt \) by keeping the first 3 terms in your power series and estimate the error using AST. (2')