The Taylor series for a function f about x = 1 is given by $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{4^n}{n}(x-1)^n$ and converges to f(x) for $|x-1|<R$, where r is the radius of convergence of the Taylor series.

a) Find the interval of convergence for Taylor Series of f.

b) Find the first three nonzero terms and the general term of the Taylor series for f', the derivative of f, about x = 1.

c) Show that $|P_2(1.1)-f'(1.1)|\leq\frac{32}{125}$.

d) The Taylor series for f' about x = 1, found in part (b), is a geometric series. Find the **function** f' to which the series converges for $|x-1|<R$.

e) Use the function in part d to determine f for $|x-1|<R$.

Determine the value of $\sum_{n=0}^{\infty}(-1)^{n}\frac{\left(\frac{1}{2}\right)^{2n+1}}{(2n+1)!}$

Determine the value of the following series given below

$$1-\frac{\left(\frac{\pi}{4}\right)^{2}}{2!}+\frac{\left(\frac{\pi}{4}\right)^{2}}{4!}-\cdots(-1)^{n}\frac{\left(\frac{\pi}{4}\right)^{2n}}{(2n)!}$$

Determine $f^{7}(x)$ in the series

$$x-\frac{x^{3}}{3}+\frac{x^{5}}{5}-\cdots+(-1)^{n}\frac{x^{2n+1}}{2n+1}$$