Answer on Question #61001 – Math – Calculus

Question

The Taylor series 0 for the function f(x)=1/(1-x) is 1+x+x^2+x^3+x^4+x^5+.....Use this to find the Taylor series for 1/(1-x^3), giving the first 3 non-zero terms.

Solution

Consider the Taylor series about 0 for the function

$f(t)=\frac{1}{1-t}=1+t+t^2+t^3+t^4+t^5+\ldots$ (It makes sense for -1<t<1).

For $t=x^3$ we get

$g(x)=\frac{1}{1-x^3}=1+(x^3)^1+(x^3)^2+(x^3)^3+(x^3)^4+(x^3)^5+\ldots=1+x^3+x^6+x^9+x^{12}+x^{15}+\ldots$,

($-1<x^3<1 \Rightarrow -1<x<1$).

The first 3 non-zero terms: $1+x^3+x^6$.

Answer: $1+x^3+x^6$.