

11.9: Representations of fcts. as Power Series

Recall $f(x) = \sum_{n=0}^{\infty} a_n x^n = \frac{1}{1-x}, |x| < 1.$

Ex 1: Find a power series representation of $\frac{1}{1+x^2}$ and the I.O.C.

Ex 2: Find a power series representation of $\frac{1}{x+2}$ and the I.O.C.

Hint: $\frac{1}{x+2} = \frac{1}{2+x} = \frac{1}{2(1+x/2)} = \frac{1}{2} \frac{1}{1-(-x/2)}$

Ex 3: $\frac{x^2}{x^2+2}$ same as #2.

Theorem: If the power series $\sum c_n(x-a)^n$ has

R.O.C. $R > 0$, then

(1) $\frac{d}{dx} \left[\sum c_n(x-a)^n \right] = \sum \frac{d}{dx} [c_n(x-a)^n]$

(2) $\int \left[\sum c_n(x-a)^n \right] = \sum \int [c_n(x-a)^n]$

NOTE: Don't forget the constant of integration.

NOTE: The Rac stays constant

Ex 4: Express $\frac{1}{2(1-x)^3}$ as a power series.

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