Answer on Question # 41766 – Math - Calculus

Expand (4-x) / (2-x)(1-x)^2 in ascending powers of x, stating when the expansion is valid; also write down the coefficient of x^n.

Answer.

$$\boldsymbol{f(x) = \frac{4-x}{(2-x)(1-x)^2} = \frac{3}{(1-x)^2} - \frac{2}{1-x} + \frac{2}{2-x}}$$

McLaurin series expansions :

$$\boldsymbol{\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n}$$

$$\boldsymbol{\frac{1}{2-x} = \sum_{n=0}^{\infty} \frac{x^n}{2^{n+1}}}$$

$$\boldsymbol{\frac{1}{(1-x)^2} = \sum_{n=0}^{\infty} (n+1)x^n}$$

So,

$$\boldsymbol{f(x) = \sum_{n=0}^{\infty} [3(n+1) - 2 + \frac{1}{2^n}]x^n = \sum_{n=0}^{\infty} (3n + 1 + \frac{1}{2^n})x^n}$$

The coefficient of x^n is $3n + 1 + \frac{1}{2^n}$.

Expansion is valid for $|x| < 1$.