

Question 9

Find the coefficient of x^4 in the Maclaurin series for $(1+x)^{1/2}$ directly from the generalized binomial formula. Do not compute the lower-degree coefficients.

Question 9 – Solution**Step 1: Identify the needed coefficient.**

In

$$(1+x)^{1/2} = \sum_{n=0}^{\infty} \binom{1/2}{n} x^n,$$

the coefficient of x^4 is exactly $\binom{1/2}{4}$.**Step 2: Evaluate only that coefficient.**

$$\begin{aligned} \binom{1/2}{4} &= \frac{(1/2)(1/2-1)(1/2-2)(1/2-3)}{4!} \\ &= \frac{(1/2)(-1/2)(-3/2)(-5/2)}{24} \\ &= \frac{-15}{16 \cdot 24} = \boxed{-\frac{5}{128}}. \end{aligned}$$

There are three negative numerator factors, so the negative sign is expected.

Conclusion.The x^4 term is $\boxed{-5x^4/128}$. Computing preceding terms is unnecessary because generalized binomial coefficients directly target any desired power.