

Q1. Find the term independent of x , where $x \neq 0$, in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^{15}$

Sol. Given expansion is $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^{15}$

$$\therefore T_{r+1} = {}^{15}C_r \left(\frac{3x^2}{2}\right)^{15-r} \left(-\frac{1}{3x}\right)^r$$

$$\text{or } T_{r+1} = {}^{15}C_r (-1)^r 3^{15-2r} 2^{r-15} x^{30-3r} \quad \text{(i)}$$

For the term independent of x , $30 - 3r = 0 \Rightarrow r = 10$

\therefore The term independent of x is

$$\begin{aligned} T_{10+1} &= {}^{15}C_{10} 3^{-5} 2^{-5} && \text{(Putting } r = 10 \text{ in (i))} \\ &= {}^{15}C_{10} \left(\frac{1}{6}\right)^5 \end{aligned}$$