# Infinite Series - Class XI

## Past Year JEE Questions

### Questions

### Quetion: 01

If $x$ is so small that $x^3$ and higher powers of $x$ may be neglected, then $\frac{(1+x)^{\frac{3}{2}}-\left(1+\frac{1}{2}x\right)^3}{(1-x)^4}$ may be approximated as

A. $1-\frac{3}{8}x^2$

B. $3x+\frac{3}{8}x^2$

C. $-\frac{3}{8}x^2$

D. $\frac{x}{2}-\frac{3}{8}x^2$

### Solutions

### Solution: 01

#### Explanation

$(1+x)^{\frac{3}{2}} = 1 + \frac{3}{2}x + \frac{\frac{3}{2}\cdot\frac{1}{2}}{1.2}x^2 + \ldots$

$= 1 + \frac{3}{2}x + \frac{3}{8}x^2$ (As $x$ is so small, so $x^3$ and higher powers of $x$ neglected)

$\frac{(1+x)^{\frac{3}{2}}-\left(1+\frac{1}{2}x\right)^3}{(1-x)^4}$

$= \frac{\left(1+\frac{3}{2}x+\frac{3}{8}x^2\right)-\left(1+{}^3C_0\frac{x}{2}+{}^3C_1\left(\frac{x}{2}\right)^2\right)}{(1-x)}$

$= \frac{\frac{3}{8}x^2-\frac{3}{4}x^2}{(1-x)}$

$= x^2\left(\frac{3}{8}-\frac{3}{4}\right)(1-x)^{-2}$

$= -\frac{3}{8}x^2\left(1-\frac{1}{2}(-x)+\ldots.\right)$

$= -\frac{3}{8}x^2-\frac{3}{16}x^3$

[ As $x^3$ is so small we can ignore $-\frac{3}{16}x^3$]

$= -\frac{3}{8}x^2$