

4(a) Find the binomial expansion of $(1+5x)^{\frac{1}{5}}$ upto x^2 .

$$x = 5x, n = \frac{1}{5}$$

$$\therefore (1+5x)^{\frac{1}{5}} = 1 + \left(\frac{1}{5}\right)(5x) + \frac{\left(\frac{1}{5}\right)\left(\frac{1}{5}-1\right)(5x)^2}{2 \times 1}$$

$$= \underline{1 + x - 2x^2}$$

(b) i) Find the binomial expansion of $(8-3x)^{-\frac{2}{3}}$ upto x^2 .

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

$$x = -\frac{3}{8}x, n = -\frac{2}{3}$$

$$\therefore (8-3x)^{-\frac{2}{3}} = \frac{1}{4} \left\{ 1 + \left(-\frac{2}{3}\right)\left(-\frac{3}{8}x\right) + \frac{\left(-\frac{2}{3}\right)\left(-\frac{2}{3}-1\right)\left(-\frac{3}{8}x\right)^2}{2 \times 1} \right\}$$
$$= \underline{\underline{\frac{1}{4} + \frac{1}{16}x + \frac{5}{256}x^2}}$$

QUESTION
PART
REFERENCE

4(b) (ii) Find an estimate for $\sqrt[3]{\frac{1}{81}}$ using your answer to part b(i)

$$\sqrt[3]{\frac{1}{81}} = (81)^{-\frac{1}{3}} \therefore (9)^{-\frac{2}{3}}$$

$$(8-3x)^{-\frac{2}{3}} \quad \text{let } x = -\frac{1}{3}$$

$$\therefore \frac{1}{4} + \frac{1}{16}\left(-\frac{1}{3}\right) + \frac{5}{256}\left(-\frac{1}{3}\right)^2$$

$$\text{So } \sqrt[3]{\frac{1}{81}} \approx \underline{\underline{0.2313}} \text{ (to 4 d.p.)}$$