

7.

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

FINEVIEW

Show that

$$\lim_{\delta x \rightarrow 0} \sum_{x=2}^3 \frac{(x-3)^2}{x^{\frac{3}{2}}} \delta x = p\sqrt{2} + q\sqrt{3}$$

where  $p$  and  $q$  are constants to be found.

(5)

$$= \int \frac{(x-3)^2}{x^{\frac{3}{2}}} dx = \int \frac{x^2 - 6x + 9}{x^{\frac{3}{2}}} dx$$

$$= \int x^{\frac{1}{2}} - 6x^{-\frac{1}{2}} + 9x^{-\frac{3}{2}} dx \quad (1 \text{ mark})$$

$$= \left(\frac{2}{3}\right)x^{\frac{3}{2}} - \left(\frac{2}{1}\right)6x^{\frac{1}{2}} + \left(-\frac{2}{1}\right)9x^{-\frac{1}{2}} + c$$

$$= \frac{2}{3}x^{\frac{3}{2}} - 12x^{\frac{1}{2}} - 18x^{-\frac{1}{2}} + c \quad (2 \text{ marks})$$

$$\left[ \frac{2}{3}x^{\frac{3}{2}} - 12x^{\frac{1}{2}} - 18x^{-\frac{1}{2}} \right]_2^3 \quad \left\{ \begin{array}{l} \nearrow \\ \nwarrow \end{array} \right. \text{limits of original summation}$$

$$= \left( \frac{2}{3}(3)^{\frac{3}{2}} - 12(3)^{\frac{1}{2}} - 18(3)^{-\frac{1}{2}} \right) - \left( \frac{2}{3}(2)^{\frac{3}{2}} - 12(2)^{\frac{1}{2}} - 18(2)^{-\frac{1}{2}} \right)$$

$$= \left( \frac{2}{3}(3\sqrt{3}) - 12\sqrt{3} - \frac{18}{\sqrt{3}} \right) - \left( \frac{2}{3}(2\sqrt{2}) - 12\sqrt{2} - \frac{18}{\sqrt{2}} \right) \quad (1 \text{ mark})$$

$$= \left( 2\sqrt{3} - 12\sqrt{3} - \frac{18\sqrt{3}}{3} \right) - \left( \frac{4}{3}\sqrt{2} - 12\sqrt{2} - \frac{18\sqrt{2}}{2} \right)$$

$$= -16\sqrt{3} - \left( -19\frac{2}{3}\sqrt{2} \right) = 19\frac{2}{3}\sqrt{2} - 16\sqrt{3} \quad (1 \text{ mark})$$