2016 14 d By summing the geometric series $1 + x + x^2 + x^3 + x^4$, or otherwise, find $\lim_{x \to 1} \dfrac{x^5 - 1}{x - 1}$. **2**

For the geometric series, $1 + x + x^2 + x^3 + x^4$,

$a = 1, r = x, n = 5, S_n = \dfrac{a(r^n - 1)}{r - 1}$:

$$S_5 = \dfrac{1(x^5 - 1)}{x - 1}$$

$$\therefore \quad \dfrac{x^5 - 1}{x - 1} = (1 + x + x^2 + x^3 + x^4)$$

$$\therefore \quad \lim_{x \to 1} \dfrac{x^5 - 1}{x - 1} = \lim_{x \to 1} (1 + x + x^2 + x^3 + x^4)$$

$$= 1 + 1 + 1 + 1 + 1$$

$$= 5$$

$$[\text{OR: } \lim_{x \to 1} \dfrac{x^5 - 1}{x - 1} = \lim_{x \to 1} \dfrac{(x - 1)(x^4 + x^3 + x^2 + x + 1)}{x - 1}$$

$$= \lim_{x \to 1} (x^4 + x^3 + x^2 + x + 1)$$

$$= 5]$$

State Mean:
0.90

BOSTES: Notes from the Marking Centre

This information is released by BOSTES in late Term 1 2017.