

5, 2, 27 Evaluate  $\sum_{k=1}^5 \frac{k^3}{225} + \left( \sum_{k=1}^5 k \right)^3$ .

Solution

We have

$$\sum_{k=1}^5 \frac{k^3}{225} + \left( \sum_{k=1}^5 k \right)^3 = \frac{1}{225} \sum_{k=1}^5 k^3 + \left( \sum_{k=1}^5 k \right)^3$$

by the Constant Multiple Rule (Theorem 5.2, A(3))

$$= \frac{1}{225} \left( \frac{(5)(5+1)}{2} \right)^2 + \left( \frac{(5)(5+1)}{2} \right)^3$$

since  $\sum_{k=1}^n k^3 = \left( \frac{n(n+1)}{2} \right)^2$  and  $\sum_{k=1}^n k = \frac{n(n+1)}{2}$

$$= \frac{1}{225} (15)^2 + (15)^3 = \frac{1}{225} (225) + 3375$$

$$= \boxed{3376} . \quad \square$$