# Sigma Notation

We often use sigma notation to write sums more compactly. For Example:

$$\sum_{i=1}^{n} f(x_i)\Delta x = f(x_1)\Delta x + f(x_2)\Delta x + f(x_3)\Delta x + \ldots + f(x_n)\Delta x$$

Here's what it means

$$\sum_{i=1}^{n} f(x_i)\Delta x$$

Ex:

1) $\sum_{i=1}^{4} i^2$

2) $\sum_{i=3}^{5} i$

3) $\sum_{k=2}^{7} \ln k$

4) $\sum_{i=1}^{7} 1$

5) $\sum_{i=3}^{8} 1$

6) $2^3 + 3^3 + 4^3 + \ldots + n^3$

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Write the following sums in expanded form

1) $\sum_{i=1}^{5} \sqrt{i}$

2) $\sum_{n=1}^{6} \frac{1}{n+1}$

3) $\sum_{i=4}^{6} (i^3+1)$

4) $\sum_{i=1}^{n} i^{10}$

5) $\sum_{k=1}^{3} k^2 i^3$

Write the following sums in sigma notation

1) $1+2+3+4+5+6+7+8+9+10$

2) $\frac{1}{2}+\frac{2}{2}+\frac{3}{2}+\ldots+\frac{9}{2}$

3) $\frac{3}{7}-\frac{4}{8}+\frac{5}{9}-\frac{6}{10}+\ldots-\frac{10}{14}$

4) $2^3+2^4+2^5+2^6+\ldots+2^n$

Sigma notation rules

1) $\sum_{i=1}^{n} c a_i$

2) $\sum_{i=1}^{n} (a_i \pm b_i)$

3) $\sum_{i=1}^{n} 1$

4) $\sum_{i=1}^{n} i$

5) $\sum_{i=1}^{n} i^2$

6) $\sum_{i=1}^{n} i^3$

Proof of 4)

Ex: Evaluate the following (as much as possible)

1) $\sum_{i=1}^{n} i(4i^2-3)$

2) $\sum_{i=1}^{6} i(i+2)$

3) $\sum_{k=0}^{8} \cos(k\pi)$

4) $\sum_{j=-2}^{4} 2^{3-j}$

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5) $\sum_{k=1}^{n} 2k$

6) $\sum_{i=1}^{n} (i^2 + 3i + 4)$

7) $\sum_{i=1}^{n} i(i+1)(i+2)$

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