Pg. 679 9.4 Sums of Powers of Integers

Sums of Powers of Integers

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

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

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

$$\sum_{i=1}^{n} i^4 = 1^4+2^4+3^4+4^4+\ldots+n^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$$

$$\sum_{i=1}^{n} i^5 = 1^5+2^5+3^5+4^5+\ldots+n^5 = \frac{n^2(n+1)^2(2n^2+2n-1)}{12}$$

Ex 1:

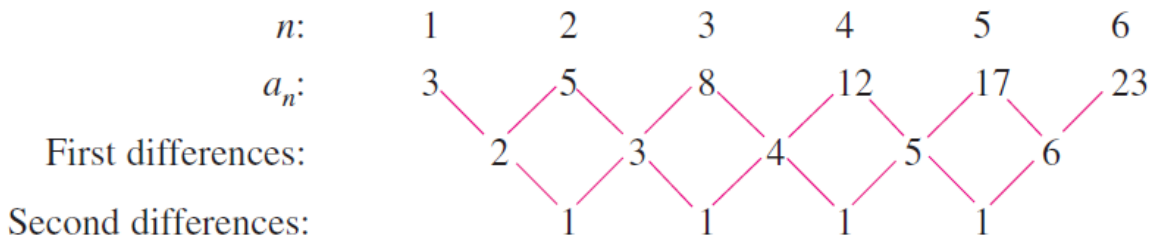
Find the sum.

a) $\sum_{i=1}^{8} i^4$

b) $\sum_{i=1}^{5} (3i^2 - 5i)$

Finite Differences

The first and second differences of a sequence 3, 5, 8, 12, 17, 23, … are as follows:



For this sequence, the second differences are all the same. When this happens the sequence has a perfect quadratic model, $a_n = an^2 + bn + c$. If the first differences are all the same, the sequence has a linear model. That is, it is arithmetic.

Ex 1:

Find model for the sequence 0, 4, 10, 18, 28, …

Assignment 9.4

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