Answer on Question #63127 – Math – Calculus

Question

Expand the expression

$$\sum_i \sum_j \sum_k a_{ik} b_{ij} x^k x^j.$$

Solution

Since b_{ij} and x^j do not depend on k, the given expression can be expanded with moving of b_{ij} and x^j to the sum by j:

$$\sum_i \sum_j \sum_k a_{ik} b_{ij} x^k x^j = \sum_i \sum_j b_{ij} x^j \sum_k a_{ik} x^k =$$

$$= \sum_i \sum_j b_{ij} x^j \left(a_{ik_1} x^{k_1} + a_{ik_2} x^{k_2} + \cdots + a_{ik_m} x^{k_m} + \cdots\right) =$$

$$= \sum_i \left(b_{ij_1} x^{j_1} + b_{ij_2} x^{j_2} + \cdots + b_{ij_n} x^{j_n} + \cdots\right)\left(a_{ik_1} x^{k_1} + a_{ik_2} x^{k_2} + \cdots + a_{ik_m} x^{k_m} + \cdots\right) =$$

$$= \left(b_{i_1 j_1} x^{j_1} + b_{i_1 j_2} x^{j_2} + \cdots + b_{i_1 j_n} x^{j_n} + \cdots\right)\left(a_{i_1 k_1} x^{k_1} + a_{i_1 k_2} x^{k_2} + \cdots + a_{i_1 k_m} x^{k_m} + \cdots\right) +$$

$$+\left(b_{i_2 j_1} x^{j_1} + b_{i_2 j_2} x^{j_2} + \cdots + b_{i_2 j_n} x^{j_n} + \cdots\right)\left(a_{i_2 k_1} x^{k_1} + a_{i_2 k_2} x^{k_2} + \cdots + a_{i_2 k_m} x^{k_m} + \cdots\right) +$$

$$+ \cdots + \left(b_{i_l j_1} x^{j_1} + b_{i_l j_2} x^{j_2} + \cdots + b_{i_l j_n} x^{j_n} + \cdots\right)\left(a_{i_l k_1} x^{k_1} + a_{i_l k_2} x^{k_2} + \cdots + a_{i_l k_m} x^{k_m} + \cdots\right) + \cdots$$

Answer: $\sum_i \sum_j b_{ij} x^j \sum_k a_{ik} x^k$.