$$u_i'(t) = \underline{f_i(u)}$$

$$u_i''(t) = \sum_j \frac{\partial f_i}{\partial u_j}\frac{du_j}{dt} = \sum_j \frac{\partial f_i}{\partial u_j} f_j(u) = \underline{f'f}$$

$$u'''(t) = \boxed{\sum_k \sum_j \frac{\partial^2 f_i}{\partial u_k \partial u_j} f_j(u) f_k(u)} + \underline{\sum_k \sum_j \frac{\partial f_j}{\partial u_k}\frac{\partial f_i}{\partial u_j} f_k(u)}$$

$$u'''(t) = \underline{f''(f,f)} + \underline{f'f'f}$$

$$u''''(t) = f'''(f,f,f) + 3f''(f,f'f) + f'f''(f,f) + f'f'f'f$$

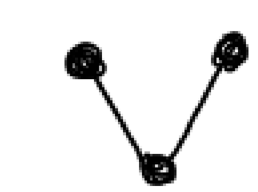
These derivatives have a 1-1 correspondence with rooted trees.

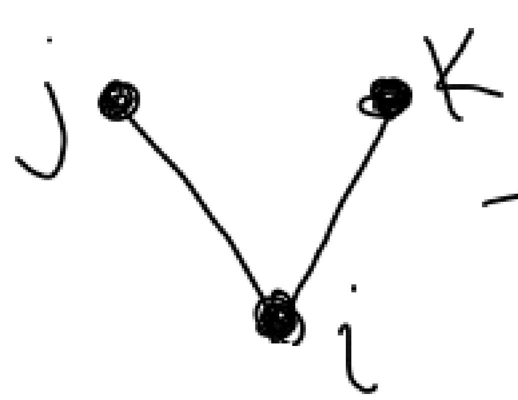
$$\sum_{i,k,j} b_i a_{ik} a_{ij}$$

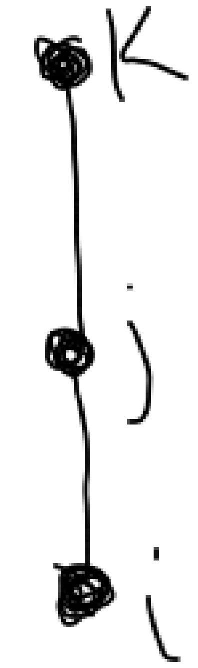
Elementary weight

$$= \sum_i b_i c_i c_i = b^T c^2 = \frac{1}{3}$$

$$\frac{1}{\text{Symmetry}}$$

of 





$$\sum_{j,k} \frac{\partial^2 f_i}{\partial u_j \partial u_k} f_j f_k$$

Elementary differential

$$\underline{\sum_{j,k} \frac{\partial f_i}{\partial u_j} \frac{\partial f_j}{\partial u_k} f_k}$$