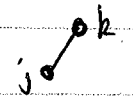
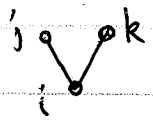
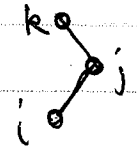
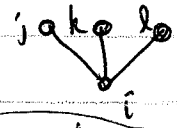
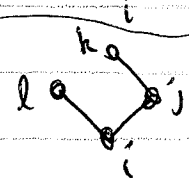
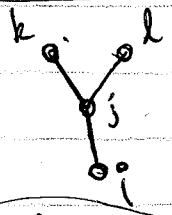
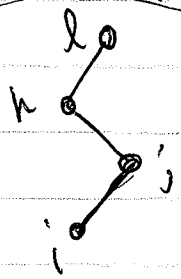
Trees and elementary differentials through order 4

q	$\hat{t}$	$\gamma(\hat{t})$	$\alpha(\hat{t})$	$F_i(\hat{t})$	$A_i(\hat{t})$
1.		1	1	f_i	1
2.		2	1	$\sum_j f_{i,j} f_j$	$\sum_j a_{ij} = c_i$
3.		3	1	$\sum_{j,k} f_{i,jk} f_j f_k$	$\sum_{j,k} a_{ij} a_{ik} = c_i^2$
		6	1	$\sum_{j,k} f_{i,j} f_{j,k} f_k$	$\sum_{j,k} a_{ij} \overbrace{a_{jk}}^{\sum_j a_{ij} c_j}$
4.		4	1	$\sum_{j,k,l} f_{i,jkl} f_j f_k f_l$	$\overbrace{\sum_{jkl} a_{ij} a_{ik} a_{il}}^{c_i^3}$
		8	3	$\sum_{j,k,l} f_{i,jl} f_{j,k} f_k f_l$	$\overbrace{\sum_{jkl} a_{ij} a_{jk} a_{il}}^{\sum_j a_{ij} c_j c_i}$
		12	1	$\sum_{jkl} f_{i,j} f_{j,kl} f_k f_l$	$\overbrace{\sum_{jkl} a_{ij} a_{jk} a_{jl}}^{\sum_j a_{ij} c_j^2}$
		24	1	$\sum_{jkl} f_{i,j} f_{j,k} f_{k,l} f_l$	$\overbrace{\sum_{jkl} a_{ij} a_{jk} a_{kl}}^{\sum_{jk} a_{ij} a_{jk} c_k}$

Examples:

$$(\tau_n^{(1)})_i = \underbrace{\alpha(\cdot)}_{1}\,\underbrace{e(\cdot)}_{1-\underbrace{\gamma(\cdot)}_{1}\sum_j b_j \underbrace{A_j(\cdot)}_{1}}\,\underbrace{F_i(\cdot)}_{f_i} = \left(1-\sum_j b_j\right) f_i$$

$$(\tau_n^{(2)})_i = \underbrace{\alpha(\cdot)}_{1}\Big(1-\underbrace{\gamma(\cdot)}_{2}\sum_j b_j \underbrace{A_j(\cdot)}_{\underbrace{\sum_k a_{jk}}_{c_j}}\Big)\underbrace{F_i(\cdot)}_{f_{i,l}f_l} = \left(1-2\sum_j b_j c_j\right)\sum_l f_{i,l}f_l$$

$$(\tau_n^{(3)})_i = \overbrace{\alpha(\cdot)}^{1}\Big(1-\overbrace{\gamma(\cdot)}^{3}\sum_j b_j \overbrace{A_j(\cdot)}^{\overbrace{\sum_{kl} a_{jk}a_{jl}}^{c_j^2}}\Big)\overbrace{F_i(\cdot)}^{f_{i,l}f_l f_k}$$

$$+\underbrace{\alpha(\cdot)}_{1}\Big(1-\underbrace{\gamma(\cdot)}_{6}\sum_j b_j \underbrace{A_j(\cdot)}_{\underbrace{\sum_{kl} a_{jk}a_{kl}}_{\sum_k a_{jk}c_k}}\Big)\underbrace{F_i(\cdot)}_{f_{i,l}f_{l,m}f_m}$$

$$(\tau_n^{(3)})_i = \left(1-3\sum_j b_j c_j^2\right)\sum_{k,l} f_{i,kl}f_k f_l$$

$$+\left(1-6\sum_{j,k} b_j a_{jk} c_k\right)\sum_{l,m} f_{i,l}f_{l,m}f_m$$