```mathematica
Kδ_{i_,j_} := KroneckerDelta[i, j];
TG_{i_,j_}[ξ_] := Expand[ξ /. {
      f_ . v_{k_} :> Plus[f v_k /. v_j -> (1 - t_i) v_i + t_i v_j,
        (1 - t_i^{-1}) (t_i ∂_{t_i} f - t_j ∂_{t_j} f) *
         (u_k /. u_j -> (1 - t_i) u_i + t_i u_j) * u_i w_j,
        Kδ_{k,i} f (u_j - u_i) u_i w_j],
      u_j -> (1 - t_i) u_i + t_i u_j,
      w_i -> w_i + (1 - t_i^{-1}) w_j,  w_j -> t_i^{-1} w_j}];
bas = {f[t_1, t_2, t_3] v_1, f[t_1, t_2, t_3] v_2, f[t_1, t_2, t_3] v_3,
   u_1, u_2, u_3, w_1, w_2, w_3};
```