Pensieve header: α and Γ extracts from MetaCalculi.nb at pensieve://Projects/MetaCalculi/.

```
tm[x_, y_, z_][β_A] := αCollect[β /. {t[x] → t[z], t[y] → t[z], c_x → c_z, c_y → c_z}];
```

```
hm[x_, y_, z_][A[ω_, σ_, μ_]] := Module[
   {α = D[μ, h[x]], β = D[μ, h[y]], Ξ = μ /. h[x] | h[y] → 0},
   A[ω,
     h[z] (∂_h[x] σ) (∂_h[y] σ) + (σ /. h[x | y] → 0),
     Ξ + h[z] (α + (∂_h[x] σ) β)
    ] // αCollect ];
```

```
tha[u_, x_][A[ω_, σ_, μ_]] := Module[{α, Θ, ϕ, Ξ, ν},
   α = Coefficient[μ, h[x] t[u]]; Θ = D[μ, t[u]] /. h[x] → 0;
   ϕ = D[μ, h[x]] /. t[u] → 0; Ξ = μ /. h[x] | t[u] → 0;
   ν = 1 + c_u α;
   A[ω * ν, σ, Plus[
      α (∂_h[x] σ) / ν * h[x] t[u], Θ (∂_h[x] σ) / ν * t[u],
      ϕ / ν * h[x], Ξ - c_u ϕ * Θ / ν
     ]] // αCollect ];
```

```
dm_{i_j→k_}[Γ[ω_, σ_, λ_]] := Module[{α, β, γ, δ, Θ, ϵ, ϕ, ψ, Ξ, μ},
   {{α, β, Θ}, {γ, δ, ϵ}, {ϕ, ψ, Ξ}} = {{∂_{t_i,h_i} λ, ∂_{t_i,h_j} λ, ∂_{t_i} λ},
     {∂_{t_j,h_i} λ, ∂_{t_j,h_j} λ, ∂_{t_j} λ}, {∂_{h_i} λ, ∂_{h_j} λ, λ}} /. (t | h)_{i|j} → 0;
   ΓCollect[Γ[(μ = 1 - β) ω,
      h_k (∂_h_i σ) (∂_h_j σ) + (σ /. h_{i|j} → 0),
      {t_k, 1}.{{γ + α δ / μ, ϵ + δ Θ / μ}, {ϕ + α ψ / μ, Ξ + Θ ψ / μ}}.{h_k, 1}
     ]] /. {T_i → T_k, T_j → T_k, b_i → b_k, b_j → b_k} // ΓCollect ];
```

```
A[ω_, σ_, μ_] // Γ := Module[{S}, S = dL[{ω, μ}];
   Γ[ω,
     Total[h_# & /@ S] + μ /. {h[a_] :> h_a, t[a_] :> c_a},
     Total[(t_# h_#) & /@ S] + (μ /. t[a_] :> c_a /. h[a_] :> h_a t_a) - μ /.
      {h[a_] :> h_a, t[a_] :> c_a t_a}
    ] /. c_a_ :> Log[T_a] // ΓCollect[FullSimplify[# /. Sinh[x_] :> (e^x - e^-x)/2] &] ];
```

```
Γ[ω_, σ_, λ_] // A := Module[{S, μ}, S = dL[Γ[ω, σ, λ]];
   μ = Total[((∂_h_# σ) t_# h_#) & /@ S] - λ;
   A[ω,
     σ /. h_a_ :> h[a], μ /. {h_a_ :> h[a], t_a_ :> t[a] / c_a}
    ] /. T_a_ :> e^c_a // αCollect ];
```