Pensieve header: Experiments with ears.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2012-05\\beta5.0"];
<< betaCalculus.m
Clear[ℏ]; Unprotect[C];
$PerturbativeDegree = 6;
βSimplify[expr_] := Replace[
   Series[Normal[expr], {ℏ, 0, $PerturbativeDegree}],
   sd_SeriesData :> MapAt[Expand, sd, 3]
  ];
βCollect[B[ω_, μ_]] := B[
   βSimplify[ω],
   βSimplify[μ]
  ];
{V, C, sol} = Get["SolutionToDegree6-120501.m"];
{V, C, sol1} = Get["SolutionToDegree6-120518.m"];
{V, C} = {
    βCollect[
      B[ω[ℏ c1, ℏ c2], α[ℏ c1, ℏ c2] t[1] h[1] +
        β[ℏ c1, ℏ c2] t[1] h[2] + γ[ℏ c1, ℏ c2] t[2] h[1] + δ[ℏ c1, ℏ c2] t[2] h[2]]
     ] /. {
       (ϵ : (α | β | γ | δ | ω | κ))[___] :> ϵ0,
       (ϵ : (α | β | γ | δ | ω | κ))^(k__)[___] :> ϵFromDigits[{k}]
     },
    βCollect[B[κ[ℏ c1], 0]] /. {
       (ϵ : (α | β | γ | δ | ω | κ))[___] :> ϵ0,
       (ϵ : (α | β | γ | δ | ω | κ))^(k__)[___] :> ϵFromDigits[{k}]
     }
   } /. sol /. sol1
```

$$\left\{\left(1+\frac{1}{16}c_1 c_2\left(1+16\,\delta_{10}\right)\hbar^2+\left(\frac{1}{256}c_1^2c_2^2\left(-1-8\,\delta_{10}+128\,\delta_{10}^2+40\left(\frac{1}{12}+\delta_{10}\right)-192\,\delta_{10}\left(\frac{1}{12}+\delta_{10}\right)+192\left(\cdots\right.\right.\right.\right.\right.$$

```
{
 "R4" → R[2, 3] ** R[1, 3] ** V == V ** (R[1, 3] // dΔ[1, 1, 2]),
 "TwistEq" → V ** θ[1, 2] == R[1, 2] ** (V // dP[2, 1]),
 "Unitarity" → V ** (V // dA[1] // dA[2]) == B[1, 0],
 "VerticalFlipEquation" → V ** (V // dS[1] // dS[2]) == R[1, 2],
 "CapEquation" → (V ** (C // dP[12]) // dcap[1] // dcap[2]) ==
   (C * (C // dP[2]) // dcap[1] // dcap[2]),
 "SidesNonDegeneracy" → (V // dη[1]) == B[1, 0] && (V // dη[2]) == B[1, 0],
 "CapsAndCups" → Simplify[C == (C // dS[1])]
}
```

$$\left\{\text{R4} \to \text{True},\ \text{TwistEq} \to \text{True},\ \text{Unitarity} \to \text{True},\right.$$
$$\text{VerticalFlipEquation} \to \text{True},\ \text{CapEquation} \to \text{True},\ \text{SidesNonDegeneracy} \to \text{True},$$
$$\text{CapsAndCups} \to 2\,c_1\,\kappa_1\,\hbar + \frac{1}{48}\,c_1^3\,\kappa_1\left(3 + 48\,\delta_{10} + 16\,\kappa_1^2\right)\hbar^3 + \frac{1}{46\,080}$$
$$\left.c_1^5\,\kappa_1\left(365 - 11\,520\,\delta_{10}^2 + 7680\,\delta_{30} + 480\,\kappa_1^2 + 768\,\kappa_1^4 + 480\,\delta_{10}\left(3 + 16\,\kappa_1^2\right)\right)\hbar^5 + O[\hbar]^7 == 0\right\}$$

V ** (V // dS[1])

$$\left(1 + \left(\frac{c_1\,c_2}{8} + c_1\,c_2\,\delta_{10}\right)\hbar^2 + \left(\frac{11}{576}\,c_1^3\,c_2 + \frac{19}{576}\,c_1^2\,c_2^2 + \frac{1}{384}\,c_1\,c_2^3 - \frac{1}{24}\,c_1^3\,c_2\,\delta_{10} + \frac{1}{4}\,c_1^2\,c_2^2\,\delta_{10} - \frac{1}{12}\,c_1\,c_2^3\,\delta_{10} - 2\,c_1^3\right.\right.$$

V ** (V // dS[2])

$$\left(1 + c_1\,c_2\,\delta_{10}\,\hbar^2 + \left(-\frac{1}{48}\,c_1^2\,c_2 + \frac{1}{24}\,c_1\,c_2^2 - \frac{1}{2}\,c_1^2\,c_2\,\delta_{10} + \frac{1}{2}\,c_1\,c_2^2\,\delta_{10}\right)\hbar^3 + \left(\frac{1}{96}\,c_1^3\,c_2 + \frac{23\,c_1^2\,c_2^2}{1152} + \frac{13\,c_1\,c_2^3}{1152} + \frac{1}{24}\,c_1^3\,c\right.\right.$$

V ** (V // dS[1]) ** V ** (V // dS[2])

$$\left(1 + \left(\frac{c_1\,c_2}{8} + 2\,c_1\,c_2\,\delta_{10}\right)\hbar^2 + \left(-\frac{1}{48}\,c_1^2\,c_2 + \frac{1}{24}\,c_1\,c_2^2 - \frac{1}{2}\,c_1^2\,c_2\,\delta_{10} + \frac{1}{2}\,c_1\,c_2^2\,\delta_{10}\right)\hbar^3 + \left(\frac{17}{576}\,c_1^3\,c_2 + \frac{61\,c_1^2\,c_2^2}{1152} + \frac{1}{72}\,c\right.\right.$$