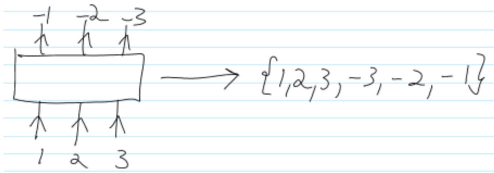
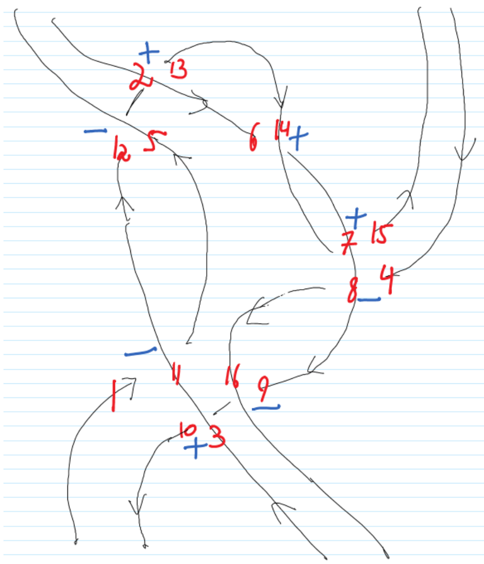



```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2014-07"];
<< "TheMetaConjugator-Program.m"
```



```
γ0 =
  Xm[11, 1] Xm[5, 12] Xp[2, 13] Xp[14, 6] Xp[7, 15] Xm[8, 4] Xm[16, 9] Xp[3, 10] // Γ //
        dm[1, 5, 1] // dm[2, 6, 2] // dm[2, 7, 2] // dm[2, 8, 2] // dm[2, 9,
      2] // dm[2, 10, 2] // dm[3, 11, 3] // dm[3, 12, 3] // dm[3, 13, 3] //
    dm[3, 14, 3] // dm[3, 15, 3] // dm[4, 16, 4] // dS[2] // dS[4];
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, 3, 4, -4, -3, -2, -1]],
  γ0[A] == γ1[A]} // ColumnForm
```

$\frac{-1+T_2+T_3}{T_2 T_3}$	S_1	S_2	S_3	
S_1	$\frac{1-T_3+T_1 T_3}{T_1 T_3}$	$\frac{(-1+T_1)(-1+T_3)}{T_1 T_3}$	$\frac{-1+T_1}{T_1}$	
S_2	$\frac{(-1+T_2)(-1+T_3)(T_2+T_3)}{T_1 T_2 T_3 (-1+T_2+T_3)}$	$\frac{T_1 T_2+T_2 T_4-T_1 T_2 T_4-T_2^2 T_4+T_1 T_2^2 T_4+T_3 T_4-2 T_2 T_3 T_4+T_2^2 T_3 T_4-T_3^2 T_4+T_2 T_3^2 T_4}{T_1 T_2 T_3 (-1+T_2+T_3) T_4}$	$\frac{(-1+T_2)(T_2+T_3)}{T_1 T_2 (-1+T_2+T_3)}$	
S_3	$\frac{-1+T_3}{T_1 T_2 (-1+T_2+T_3)}$	$\frac{(-1+T_3)(T_1-T_1 T_4+T_1 T_2 T_4+T_3 T_4)}{T_1 T_2 T_3 (-1+T_2+T_3) T_4}$	$\frac{T_3}{T_1 T_2 (-1+T_2+T_3)}$	(
S_4	0	$\frac{-1+T_4}{T_2 T_3 T_4}$	0	
Γ	$\frac{1}{T_3}$	$\frac{1}{T_3^2 T_4}$	$\frac{1}{T_1 T_2^2}$	

$\frac{-1+T_2+T_3}{T_2 T_3}$	S_1	S_2	S_3	
S_1	$\frac{1}{T_3}$	0	$\frac{-1+T_3}{T_3}$	
S_2	$\frac{(-1+T_1)(-1+T_3)}{T_1 T_3 (-1+T_2+T_3)}$	$\frac{T_2}{T_3 (-1+T_2+T_3) T_4}$	$\frac{(-1+T_3)(T_1 T_2+T_4-T_1 T_4+T_1 T_3 T_4)}{T_1 T_3 (-1+T_2+T_3) T_4}$	— (
S_3	$\frac{-1+T_1}{T_1 T_2 (-1+T_2+T_3)}$	$\frac{(-1+T_2)(T_2+T_3)}{T_2 T_3 (-1+T_2+T_3) T_4}$	$\frac{T_1 T_2-T_1 T_2^2+T_1 T_3-2 T_1 T_2 T_3+T_1 T_2^2 T_3-T_1 T_3^2+T_1 T_2 T_3^2+T_3 T_4-T_1 T_3 T_4+T_1 T_3^2 T_4}{T_1 T_2 T_3 (-1+T_2+T_3) T_4}$	(-1+T2 / T2
S_4	0	$\frac{-1+T_2}{T_2 T_3 T_4}$	$\frac{(-1+T_2)(-1+T_3)}{T_2 T_3 T_4}$	
Γ	$\frac{1}{T_3}$	$\frac{1}{T_3^2 T_4}$	$\frac{1}{T_1 T_2^2}$	

$\frac{-1+T_2+T_3}{T_2 T_3}$	S_1	S_2	S_3	
S_1	$\frac{1-T_3+T_1 T_3}{T_1 T_3}$	$\frac{(-1+T_1)(-1+T_3)}{T_1 T_3}$	$\frac{-1+T_1}{T_1}$	
S_2	$\frac{(-1+T_2)(-1+T_3)(T_2+T_3)}{T_1 T_2 T_3 (-1+T_2+T_3)}$	$\frac{T_1 T_2+T_2 T_4-T_1 T_2 T_4-T_2^2 T_4+T_1 T_2^2 T_4+T_3 T_4-2 T_2 T_3 T_4+T_2^2 T_3 T_4-T_3^2 T_4+T_2 T_3^2 T_4}{T_1 T_2 T_3 (-1+T_2+T_3) T_4}$	$\frac{(-1+T_2)(T_2+T_3)}{T_1 T_2 (-1+T_2+T_3)}$	
S_3	$\frac{-1+T_3}{T_1 T_2 (-1+T_2+T_3)}$	$\frac{(-1+T_3)(T_1-T_1 T_4+T_1 T_2 T_4+T_3 T_4)}{T_1 T_2 T_3 (-1+T_2+T_3) T_4}$	$\frac{T_3}{T_1 T_2 (-1+T_2+T_3)}$	(
S_4	0	$\frac{-1+T_4}{T_2 T_3 T_4}$	0	
Γ	0	0	0	

True

```
γ0 = ϵ[1] ϵ[2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -2, -1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & S_1 & S_2 \\ S_1 & 1 & 0 \\ S_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & S_1 & S_2 \\ S_1 & 1 & 0 \\ S_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & S_1 & S_2 \\ S_1 & 1 & 0 \\ S_2 & 0 & 1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xp[1, 2] ** Xp[2, 1] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -2, -1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & T_2 & -(-1+T_1)\,T_2 \\ s_2 & 1-T_2 & 1-T_2+T_1T_2 \\ \Gamma & T_2 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1-T_1+T_1T_2 & -T_1\,(-1+T_2) \\ s_2 & 1-T_1 & T_1 \\ \Gamma & T_2 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & T_2 & -(-1+T_1)\,T_2 \\ s_2 & 1-T_2 & 1-T_2+T_1T_2 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xm[2, 1] ** Xp[2, 1] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -2, -1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xm[2, 1] ** Xm[1, 2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -2, -1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1-T_2+T_1T_2}{T_1T_2} & \frac{-1+T_1}{T_1} \\ s_2 & \frac{-1+T_2}{T_1T_2} & \frac{1}{T_1} \\ \Gamma & \frac{1}{T_2} & \frac{1}{T_1} \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1}{T_2} & \frac{-1+T_2}{T_2} \\ s_2 & \frac{-1+T_1}{T_1T_2} & \frac{1-T_1+T_1T_2}{T_1T_2} \\ \Gamma & \frac{1}{T_2} & \frac{1}{T_1} \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1-T_2+T_1T_2}{T_1T_2} & \frac{-1+T_1}{T_1} \\ s_2 & \frac{-1+T_2}{T_1T_2} & \frac{1}{T_1} \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xp[1, 2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -1, -2]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 1-T_1 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xm[2, 1] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -1, -2]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1}{T_2} & 0 \\ s_2 & \frac{-1+T_2}{T_2} & 1 \\ \Gamma & \frac{1}{T_2} & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1}{T_2} & \frac{-1+T_2}{T_2} \\ s_2 & 0 & 1 \\ \Gamma & \frac{1}{T_2} & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{1}{T_2} & 0 \\ s_2 & \frac{-1+T_2}{T_2} & 1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xp[2, 1] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, 2, -1, -2]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & T_2 & 0 \\ s_2 & 1-T_2 & 1 \\ \Gamma & T_2 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & T_2 & 1-T_2 \\ s_2 & 0 & 1 \\ \Gamma & T_2 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & \frac{\beta-\beta T_1+\alpha T_2-\beta T_2^2}{\alpha-\beta T_1 T_2} & -\frac{(-1+T_1)(1+T_2)(-\alpha+\beta T_2)}{-\alpha+\beta T_1 T_2} \\ s_2 & -\frac{(-1+T_2)(-\beta T_1+\alpha T_2)}{-\alpha+\beta T_1 T_2} & -\frac{-\alpha T_1+\beta T_1 T_2-\alpha T_2^2+\alpha T_1 T_2^2}{\alpha-\beta T_1 T_2} \\ \Gamma & 0 & 0 \end{pmatrix},\right.$$

$$\{\{T_2, 0\}, \{1-T_2, 1\}\} == \left\{\left\{\frac{\beta-\beta T_1+\alpha T_2-\beta T_2^2}{\alpha-\beta T_1 T_2}, -\frac{(-1+T_1)(1+T_2)(-\alpha+\beta T_2)}{-\alpha+\beta T_1 T_2}\right\},\right.$$
$$\left.\left.\left\{-\frac{(-1+T_2)(-\beta T_1+\alpha T_2)}{-\alpha+\beta T_1 T_2}, -\frac{-\alpha T_1+\beta T_1 T_2-\alpha T_2^2+\alpha T_1 T_2^2}{\alpha-\beta T_1 T_2}\right\}\right\}\right\}$$

```
γ0 = Xp[1, 2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[2, -1, -2, 1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 1-T_1 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} T_1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
Ω[2, -1, -2, 1] /. {α → 1, β → 0}
```

$$\begin{pmatrix} -\frac{-1+T_1 T_2-T_1^2 T_2}{T_1} & s_{-2} & s_{-1} & s_1 & s_2 \\ s_{-2} & -\frac{(1-T_1+T_1^2)(-1+T_2)}{1-T_1 T_2+T_1^2 T_2} & -\frac{(-1+T_1)(-1+T_2)}{1-T_1 T_2+T_1^2 T_2} & \frac{T_1^2(-1+T_2)}{1-T_1 T_2+T_1^2 T_2} & 0 \\ s_{-1} & \frac{(-1+T_1)^2(-1+T_2)}{1-T_1 T_2+T_1^2 T_2} & -\frac{(-1+T_1)(1-T_2+T_1 T_2)}{1-T_1 T_2+T_1^2 T_2} & \frac{(-1+T_1) T_1}{1-T_1 T_2+T_1^2 T_2} & 0 \\ s_1 & -\frac{-1+T_2}{1-T_1 T_2+T_1^2 T_2} & -\frac{(-1+T_1) T_2}{1-T_1 T_2+T_1^2 T_2} & -\frac{T_1}{(-1+T_1)(1-T_1 T_2+T_1^2 T_2)} & 0 \\ s_2 & \frac{(-1+T_1)(-1+T_2)}{1-T_1 T_2+T_1^2 T_2} & \frac{(-1+T_1)^2 T_2}{1-T_1 T_2+T_1^2 T_2} & \frac{T_1}{1-T_1 T_2+T_1^2 T_2} & -\frac{1}{-1+T_2} \\ \Gamma & 0 & 0 & 0 & 0 \end{pmatrix}$$

```
γ0 = Xp[1, 2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[-1, -2, 1, 2]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 1-T_1 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} T_1 T_2 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = Xp[1, 2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[-2, 1, 2, -1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 1-T_1 & T_1 \\ \Gamma & 1 & T_1 \end{pmatrix}, \begin{pmatrix} T_2 & s_1 & s_2 \\ s_1 & 1 & 1-T_1 \\ s_2 & 0 & T_1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = ϵ[1] ϵ[2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[1, -1, 2, -2]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
γ0 = ϵ[1] ϵ[2] // Γ;
{γ0, Mirror[γ0], γ1 = Conj[Mirror[γ0], Ω[-1, 2, -2, 1]], γ0[A] == γ1[A]}
```

$$\left\{\begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 1 & 1 \end{pmatrix}, \begin{pmatrix} T_1 & s_1 & s_2 \\ s_1 & 1 & 0 \\ s_2 & 0 & 1 \\ \Gamma & 0 & 0 \end{pmatrix}, \text{True}\right\}$$

```
{Ω[1, 2, -2, -1], Ω[1, 2, -1, -2]}
```

$$\left\{\begin{pmatrix} 1 & s_{-2} & s_{-1} & s_1 & s_2 \\ s_{-2} & -\frac{(-\alpha+\beta T_1)(-1+T_2)}{(\alpha-\beta)(-\alpha+\beta T_1 T_2)} & -\frac{\beta(-1+T_1)(-1+T_2)}{(-\alpha+\beta)(-\alpha+\beta T_1 T_2)} & 0 & 0 \\ s_{-1} & -\frac{\alpha(-1+T_1)(-1+T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & -\frac{(-1+T_1)(-\alpha+\beta T_2)}{(\alpha-\beta)(-\alpha+\beta T_1 T_2)} & 0 & 0 \\ s_1 & 0 & 0 & \frac{-\alpha+\beta T_1}{-1+T_1} & \alpha \\ s_2 & 0 & 0 & \beta & \frac{-\alpha+\beta T_2}{-1+T_2} \\ \Gamma & 0 & 0 & 0 & 0 \end{pmatrix},\right.$$

$$\left.\begin{pmatrix} 1 & s_{-2} & s_{-1} & s_1 & s_2 \\ s_{-2} & -\frac{(\alpha-\beta T_1)(-1+T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & -\frac{\alpha(-1+T_1)(-1+T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & 0 & 0 \\ s_{-1} & -\frac{\beta(-1+T_1)(-1+T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & -\frac{(-1+T_1)(\alpha-\beta T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & 0 & 0 \\ s_1 & 0 & 0 & \frac{-\alpha+\beta T_1}{-1+T_1} & \alpha \\ s_2 & 0 & 0 & \beta & \frac{-\alpha+\beta T_2}{-1+T_2} \\ \Gamma & 0 & 0 & 0 & 0 \end{pmatrix}\right\}$$

```
{Ω[1, 2, -2, -1], Ω[2, -2, -1, 1]}
```

$$\left\{\begin{pmatrix} 1 & s_{-2} & s_{-1} & s_1 & s_2 \\ s_{-2} & -\frac{(-\alpha+\beta T_1)(-1+T_2)}{(\alpha-\beta)(-\alpha+\beta T_1 T_2)} & -\frac{\beta(-1+T_1)(-1+T_2)}{(-\alpha+\beta)(-\alpha+\beta T_1 T_2)} & 0 & 0 \\ s_{-1} & -\frac{\alpha(-1+T_1)(-1+T_2)}{(\alpha-\beta)(\alpha-\beta T_1 T_2)} & -\frac{(-1+T_1)(-\alpha+\beta T_2)}{(\alpha-\beta)(-\alpha+\beta T_1 T_2)} & 0 & 0 \\ s_1 & 0 & 0 & \frac{-\alpha+\beta T_1}{-1+T_1} & \alpha \\ s_2 & 0 & 0 & \beta & \frac{-\alpha+\beta T_2}{-1+T_2} \\ \Gamma & 0 & 0 & 0 & 0 \end{pmatrix},\right.$$

$$\begin{pmatrix} \frac{-\alpha+\beta T_1-\beta T_1^2+\alpha T_1 T_2-\alpha T_1^2 T_2+\beta T_1^3 T_2}{T_1(-\alpha+\beta T_1 T_2)} & \\ s_{-2} & -\frac{(\alpha-\beta T}{(\alpha-\beta)(\alpha-\beta T_1} \\ s_{-1} & -\frac{(-1+T_1)}{(\alpha-\beta)(\alpha-\beta T_1} \\ s_1 & -\frac{T_1}{-\alpha+\beta T_1-\beta} \\ s_2 & \frac{\alpha(-}{\alpha-\beta T_1+\beta T} \\ \Gamma & \end{pmatrix}$$

SolveAlways[

$$-\frac{(-\alpha+\beta T_1)(-1+T_2)}{(\alpha-\beta)(-\alpha+\beta T_1 T_2)} == -\frac{(\alpha-\beta T_1)\left(1-T_1+T_1^2\right)(-1+T_2)}{(\alpha-\beta)\left(\alpha-\beta T_1+\beta T_1^2-\alpha T_1 T_2+\alpha T_1^2 T_2-\beta T_1^3 T_2\right)},\ \{T_1, T_2\}]$$

$\{\{\alpha\to 0,\ \beta\to 0\}\}$

Eigenvalues[Ω[1, 2, -2, -1][A]]

$$\Big\{\Big(-2\alpha+3\alpha T_1+\beta T_1-\alpha T_1^2-\beta T_1^2+3\alpha T_2+\beta T_2-4\alpha T_1 T_2-4\beta T_1 T_2+\alpha T_1^2 T_2+3\beta T_1^2 T_2-\alpha T_2^2-\beta T_2^2+\alpha T_1 T_2^2+3\beta T_1 T_2^2-2\beta T_1^2 T_2^2-(-1+T_1)(-1+T_2)\sqrt{\left(4\alpha\beta-8\alpha\beta T_1+\alpha^2 T_1^2+2\alpha\beta T_1^2+\beta^2 T_1^2-8\alpha\beta T_2-2\alpha^2 T_1 T_2+20\alpha\beta T_1 T_2-2\beta^2 T_1 T_2-8\alpha\beta T_1^2 T_2+\alpha^2 T_2^2+2\alpha\beta T_2^2+\beta^2 T_2^2-8\alpha\beta T_1 T_2^2+4\alpha\beta T_1^2 T_2^2\right)}\Big)\Big/$$
$$(2(\alpha-\beta)(-1+T_1)(-1+T_2)(-\alpha+\beta T_1 T_2)),\ \Big(-2\alpha+3\alpha T_1+\beta T_1-\alpha T_1^2-\beta T_1^2+3\alpha T_2+\beta T_2-4\alpha T_1 T_2-4\beta T_1 T_2+\alpha T_1^2 T_2+3\beta T_1^2 T_2-\alpha T_2^2-\beta T_2^2+\alpha T_1 T_2^2+3\beta T_1 T_2^2-2\beta T_1^2 T_2^2+(-1+T_1)(-1+T_2)\sqrt{\left(4\alpha\beta-8\alpha\beta T_1+\alpha^2 T_1^2+2\alpha\beta T_1^2+\beta^2 T_1^2-8\alpha\beta T_2-2\alpha^2 T_1 T_2+20\alpha\beta T_1 T_2-2\beta^2 T_1 T_2-8\alpha\beta T_1^2 T_2+\alpha^2 T_2^2+2\alpha\beta T_2^2+\beta^2 T_2^2-8\alpha\beta T_1 T_2^2+4\alpha\beta T_1^2 T_2^2\right)}\Big)\Big/$$
$$(2(\alpha-\beta)(-1+T_1)(-1+T_2)(-\alpha+\beta T_1 T_2)),\ \Big(-2\alpha^3+2\alpha^2\beta+\alpha^3 T_1-\alpha\beta^2 T_1+\alpha^3 T_2-\alpha\beta^2 T_2-\alpha^2\beta T_1^2 T_2+\beta^3 T_1^2 T_2-\alpha^2\beta T_1 T_2^2+\beta^3 T_1 T_2^2+2\alpha\beta^2 T_1^2 T_2^2-2\beta^3 T_1^2 T_2^2-(\alpha-\beta)(\alpha-\beta T_1 T_2)\sqrt{\left(4\alpha\beta-8\alpha\beta T_1+\alpha^2 T_1^2+2\alpha\beta T_1^2+\beta^2 T_1^2-8\alpha\beta T_2-2\alpha^2 T_1 T_2+20\alpha\beta T_1 T_2-2\beta^2 T_1 T_2-8\alpha\beta T_1^2 T_2+\alpha^2 T_2^2+2\alpha\beta T_2^2+\beta^2 T_2^2-8\alpha\beta T_1 T_2^2+4\alpha\beta T_1^2 T_2^2\right)}\Big)\Big/$$
$$(2(\alpha-\beta)(-1+T_1)(-1+T_2)(-\alpha+\beta T_1 T_2)),\ \Big(-2\alpha^3+2\alpha^2\beta+\alpha^3 T_1-\alpha\beta^2 T_1+\alpha^3 T_2-\alpha\beta^2 T_2-\alpha^2\beta T_1^2 T_2+\beta^3 T_1^2 T_2-\alpha^2\beta T_1 T_2^2+\beta^3 T_1 T_2^2+2\alpha\beta^2 T_1^2 T_2^2-2\beta^3 T_1^2 T_2^2+(\alpha-\beta)(\alpha-\beta T_1 T_2)\sqrt{\left(4\alpha\beta-8\alpha\beta T_1+\alpha^2 T_1^2+2\alpha\beta T_1^2+\beta^2 T_1^2-8\alpha\beta T_2-2\alpha^2 T_1 T_2+20\alpha\beta T_1 T_2-2\beta^2 T_1 T_2-8\alpha\beta T_1^2 T_2+\alpha^2 T_2^2+2\alpha\beta T_2^2+\beta^2 T_2^2-8\alpha\beta T_1 T_2^2+4\alpha\beta T_1^2 T_2^2\right)}\Big)\Big/$$
$$(2(\alpha-\beta)(-1+T_1)(-1+T_2)(-\alpha+\beta T_1 T_2))\Big\}$$