In[∘]:= **cS₁[𝔼{}→{1}[0, 0, y₁]]**

Out[∘]= $\mathbb{E}_{\{\}\to\{1\}}\left[0, 0, -y_1 + O[\epsilon]^4\right]$

In[∘]:= **{m, i, k}**

Out[∘]= {m, i, k}

In[∘]:= **cS₁[𝔼{}→{1}[0, 0, y₁]]**

Out[∘]= $\mathbb{E}_{\{\}\to\{1\}}\left[0, 0, -y_1 + O[\epsilon]^4\right]$

In[∘]:= **m = cm**

Out[∘]= cm

In[∘]:= **cS₁[𝔼{}→{1}[0, 0, y₁]]**

Out[∘]= $\mathbb{E}_{\{\}\to\{1\}}\left[0, 0, -y_1 + O[\epsilon]^4\right]$

In[∘]:= **i = 1**

Out[∘]= 1

In[∘]:= **cS₁[𝔼{}→{1}[0, 0, y₁]]**

Out[∘]= $\mathbb{E}_{\{\}\to\{1\}}\left[0, 0, -y_1 + O[\epsilon]^4\right]$

In[∘]:= **{m, i, k} = {cm, 1, 1}**

Out[∘]= {cm, 1, 1}

In[∘]:= **{λ, P} = {η, Last@cS₁[𝔼{}→{1}[0, 0, y₁]]}**

Out[∘]= $\left\{\eta, -y_1 + O[\epsilon]^4\right\}$

In[∘]:= **P0 = Normal@P /. ϵ → 0**

Out[∘]= $-y_1$

In[∘]:= **φs = Flatten@Table[φ_{j1,j2,j3,j4}[λ], {j2, 0, k}, {j3, 0, k - j2}, {j1, 0, 2 k + 1 - j2 - j3}, {j4, 0, 2 k + 1 - j3 - j2 - j1}]**

Out[∘]= $\{\varphi_{0,0,0,0}[\eta], \varphi_{0,0,0,1}[\eta], \varphi_{0,0,0,2}[\eta], \varphi_{0,0,0,3}[\eta], \varphi_{1,0,0,0}[\eta], \varphi_{1,0,0,1}[\eta], \varphi_{1,0,0,2}[\eta], \varphi_{2,0,0,0}[\eta], \varphi_{2,0,0,1}[\eta], \varphi_{3,0,0,0}[\eta], \varphi_{0,0,1,0}[\eta], \varphi_{0,0,1,1}[\eta], \varphi_{0,0,1,2}[\eta], \varphi_{1,0,1,0}[\eta], \varphi_{1,0,1,1}[\eta], \varphi_{2,0,1,0}[\eta], \varphi_{0,1,0,0}[\eta], \varphi_{0,1,0,1}[\eta], \varphi_{0,1,0,2}[\eta], \varphi_{1,1,0,0}[\eta], \varphi_{1,1,0,1}[\eta], \varphi_{2,1,0,0}[\eta]\}$

In[∘]:= **Length[φs]**

Out[∘]= 22

In[∘]:= **F = Normal@Last@Exp_{m,i,k-1}[λ, P] + ϵ^k φs.(φs /. φ_{js__}[λ] :→ Times @@ {y_i, b_i, a_i, x_i}^{js})**

Out[∘]= $1 + \epsilon\,(\varphi_{0,0,0,0}[\eta] + x_1\,\varphi_{0,0,0,1}[\eta] + x_1^2\,\varphi_{0,0,0,2}[\eta] + x_1^3\,\varphi_{0,0,0,3}[\eta] + a_1\,\varphi_{0,0,1,0}[\eta] + a_1 x_1\,\varphi_{0,0,1,1}[\eta] + a_1 x_1^2\,\varphi_{0,0,1,2}[\eta] + b_1\,\varphi_{0,1,0,0}[\eta] + b_1 x_1\,\varphi_{0,1,0,1}[\eta] + b_1 x_1^2\,\varphi_{0,1,0,2}[\eta] + y_1\,\varphi_{1,0,0,0}[\eta] + x_1 y_1\,\varphi_{1,0,0,1}[\eta] + x_1^2 y_1\,\varphi_{1,0,0,2}[\eta] + a_1 y_1\,\varphi_{1,0,1,0}[\eta] + a_1 x_1 y_1\,\varphi_{1,0,1,1}[\eta] + b_1 y_1\,\varphi_{1,1,0,0}[\eta] + b_1 x_1 y_1\,\varphi_{1,1,0,1}[\eta] + y_1^2\,\varphi_{2,0,0,0}[\eta] + x_1 y_1^2\,\varphi_{2,0,0,1}[\eta] + a_1 y_1^2\,\varphi_{2,0,1,0}[\eta] + b_1 y_1^2\,\varphi_{2,1,0,0}[\eta] + y_1^3\,\varphi_{3,0,0,0}[\eta])$

In[∘]:=
```
rhs = Normal@Last@m_{i,j→i}[𝔼_{{}→{i}}[λ P0 /. (x | y)_i → 0, λ P0 /. (b | a | t)_i → 0, F + O[ϵ]^(k+1)]
  𝔼_{{}→{j}}[0, 0, P + O[ϵ]^(k+1) /. u_i_ :→ u_j]]
```

Out[∘]=
$$-y_1 + \in \big(-\gamma b_1 \varphi_{0,0,0,1}[\eta] - 2\gamma b_1 x_1 \varphi_{0,0,0,2}[\eta] - 3\gamma b_1 x_1^2 \varphi_{0,0,0,3}[\eta] - x_1^3 y_1 \varphi_{0,0,0,3}[\eta] - a_1 y_1 \varphi_{0,0,1,0}[\eta] + y_1 (-\varphi_{0,0,0,0}[\eta] + \gamma \varphi_{0,0,1,0}[\eta]) - \gamma a_1 b_1 \varphi_{0,0,1,1}[\eta] - a_1 x_1 y_1 \varphi_{0,0,1,1}[\eta] + x_1 y_1 (-\varphi_{0,0,0,1}[\eta] + \gamma \varphi_{0,0,1,1}[\eta]) - 2\gamma a_1 b_1 x_1 \varphi_{0,0,1,2}[\eta] - a_1 x_1^2 y_1 \varphi_{0,0,1,2}[\eta] + x_1^2 y_1 (-\varphi_{0,0,0,2}[\eta] + \gamma \varphi_{0,0,1,2}[\eta]) - \gamma b_1^2 \varphi_{0,1,0,1}[\eta] - 2\gamma b_1^2 x_1 \varphi_{0,1,0,2}[\eta] - b_1 x_1^2 y_1 \varphi_{0,1,0,2}[\eta] + b_1 y_1 (-\varphi_{0,1,0,0}[\eta] - \gamma \varphi_{1,0,0,1}[\eta]) - x_1^2 y_1^2 \varphi_{1,0,0,2}[\eta] + b_1 x_1 y_1 \big(-\varphi_{0,1,0,1}[\eta] - 2\gamma \varphi_{1,0,0,2}[\eta]\big) - a_1 y_1^2 \varphi_{1,0,1,0}[\eta] + y_1^2 (-\varphi_{1,0,0,0}[\eta] + \gamma \varphi_{1,0,1,0}[\eta]) - \gamma a_1 b_1 y_1 \varphi_{1,0,1,1}[\eta] - a_1 x_1 y_1^2 \varphi_{1,0,1,1}[\eta] + x_1 y_1^2 (-\varphi_{1,0,0,1}[\eta] + \gamma \varphi_{1,0,1,1}[\eta]) - \gamma b_1^2 y_1 \varphi_{1,1,0,1}[\eta] - b_1 x_1 y_1^2 \varphi_{1,1,0,1}[\eta] - x_1 y_1^3 \varphi_{2,0,0,1}[\eta] + b_1 y_1^2 (-\varphi_{1,1,0,0}[\eta] - \gamma \varphi_{2,0,0,1}[\eta]) - a_1 y_1^3 \varphi_{2,0,1,0}[\eta] + y_1^3 (-\varphi_{2,0,0,0}[\eta] + \gamma \varphi_{2,0,1,0}[\eta]) - b_1 y_1^3 \varphi_{2,1,0,0}[\eta] - y_1^4 \varphi_{3,0,0,0}[\eta]\big)$$

In[∘]:=
```
at0 = (# == 0) & /@ Flatten@CoefficientList[F - 1 /. λ → 0, {y_i, b_i, a_i, x_i}]
```

Out[∘]=
$\{\in \varphi_{0,0,0,0}[0] == 0, \in \varphi_{0,0,0,1}[0] == 0, \in \varphi_{0,0,0,2}[0] == 0, \in \varphi_{0,0,0,3}[0] == 0, \in \varphi_{0,0,1,0}[0] == 0, \in \varphi_{0,0,1,1}[0] == 0, \in \varphi_{0,0,1,2}[0] == 0,$ True, $\in \varphi_{0,1,0,0}[0] == 0, \in \varphi_{0,1,0,1}[0] == 0, \in \varphi_{0,1,0,2}[0] == 0,$ True, True, True, True, True, $\in \varphi_{1,0,0,0}[0] == 0, \in \varphi_{1,0,0,1}[0] == 0, \in \varphi_{1,0,0,2}[0] == 0,$ True, $\in \varphi_{1,0,1,0}[0] == 0, \in \varphi_{1,0,1,1}[0] == 0,$ True, True, $\in \varphi_{1,1,0,0}[0] == 0, \in \varphi_{1,1,0,1}[0] == 0,$ True, True, True, True, True, True, $\in \varphi_{2,0,0,0}[0] == 0, \in \varphi_{2,0,0,1}[0] == 0,$ True, True, $\in \varphi_{2,0,1,0}[0] == 0,$ True, True, True, $\in \varphi_{2,1,0,0}[0] == 0,$ True, True, True, True, True, True, True, $\in \varphi_{3,0,0,0}[0] == 0,$ True, True, True, True, True, True, True, True, True, True, True, True, True, True, True$\}$

In[∘]:=
```
Sort[First /@ CoefficientRules[P0 F - rhs, {y_i, b_i, a_i, x_i}]]
```

Out[∘]=
```
{{0, 1, 0, 0}, {0, 1, 0, 1}, {0, 1, 0, 2}, {0, 1, 1, 0}, {0, 1, 1, 1}, {0, 2, 0, 0},
 {0, 2, 0, 1}, {1, 0, 0, 0}, {1, 0, 0, 1}, {1, 0, 0, 2}, {1, 1, 0, 0}, {1, 1, 0, 1},
 {1, 1, 1, 0}, {1, 2, 0, 0}, {2, 0, 0, 0}, {2, 0, 0, 1}, {2, 1, 0, 0}, {3, 0, 0, 0}}
```

In[∘]:=
```
Sort[φs]
```

Out[∘]=
$\{\varphi_{0,0,0,0}[\eta], \varphi_{0,0,0,1}[\eta], \varphi_{0,0,0,2}[\eta], \varphi_{0,0,0,3}[\eta], \varphi_{0,0,1,0}[\eta], \varphi_{0,0,1,1}[\eta], \varphi_{0,0,1,2}[\eta], \varphi_{0,1,0,0}[\eta], \varphi_{0,1,0,1}[\eta], \varphi_{0,1,0,2}[\eta], \varphi_{1,0,0,0}[\eta], \varphi_{1,0,0,1}[\eta], \varphi_{1,0,0,2}[\eta], \varphi_{1,0,1,0}[\eta], \varphi_{1,0,1,1}[\eta], \varphi_{1,1,0,0}[\eta], \varphi_{1,1,0,1}[\eta], \varphi_{2,0,0,0}[\eta], \varphi_{2,0,0,1}[\eta], \varphi_{2,0,1,0}[\eta], \varphi_{2,1,0,0}[\eta], \varphi_{3,0,0,0}[\eta]\}$

In[ ]:= $(\partial_\lambda F) + P0\, F - rhs$

Out[ ]=
$$\begin{aligned}
& y_1 - \\
& \epsilon \Big(-\gamma b_1 \varphi_{0,0,0,1}[\eta] - 2\gamma b_1 x_1 \varphi_{0,0,0,2}[\eta] - 3\gamma b_1 x_1^2 \varphi_{0,0,0,3}[\eta] - x_1^3 y_1 \varphi_{0,0,0,3}[\eta] - a_1 y_1 \varphi_{0,0,1,0}[\eta] + \\
& \quad y_1 (-\varphi_{0,0,0,0}[\eta] + \gamma \varphi_{0,0,1,0}[\eta]) - \gamma a_1 b_1 \varphi_{0,0,1,1}[\eta] - a_1 x_1 y_1 \varphi_{0,0,1,1}[\eta] + \\
& \quad x_1 y_1 (-\varphi_{0,0,0,1}[\eta] + \gamma \varphi_{0,0,1,1}[\eta]) - 2\gamma a_1 b_1 x_1 \varphi_{0,0,1,2}[\eta] - a_1 x_1^2 y_1 \varphi_{0,0,1,2}[\eta] + \\
& \quad x_1^2 y_1 (-\varphi_{0,0,0,2}[\eta] + \gamma \varphi_{0,0,1,2}[\eta]) - \gamma b_1^2 \varphi_{0,1,0,1}[\eta] - 2\gamma b_1^2 x_1 \varphi_{0,1,0,2}[\eta] - \\
& \quad b_1 x_1^2 y_1 \varphi_{0,1,0,2}[\eta] + b_1 y_1 (-\varphi_{0,1,0,0}[\eta] - \gamma \varphi_{1,0,0,1}[\eta]) - x_1^2 y_1^2 \varphi_{1,0,0,2}[\eta] + \\
& \quad b_1 x_1 y_1 \big(-\varphi_{0,1,0,1}[\eta] - 2\gamma \varphi_{1,0,0,2}[\eta]\big) - a_1 y_1^2 \varphi_{1,0,1,0}[\eta] + y_1^2 (-\varphi_{1,0,0,0}[\eta] + \gamma \varphi_{1,0,1,0}[\eta]) - \\
& \quad \gamma a_1 b_1 y_1 \varphi_{1,0,1,1}[\eta] - a_1 x_1 y_1^2 \varphi_{1,0,1,1}[\eta] + x_1 y_1^2 (-\varphi_{1,0,0,1}[\eta] + \gamma \varphi_{1,0,1,1}[\eta]) - \\
& \quad \gamma b_1^2 y_1 \varphi_{1,1,0,1}[\eta] - b_1 x_1 y_1^2 \varphi_{1,1,0,1}[\eta] - x_1 y_1^3 \varphi_{2,0,0,1}[\eta] + b_1 y_1^2 (-\varphi_{1,1,0,0}[\eta] - \gamma \varphi_{2,0,0,1}[\eta]) - \\
& \quad a_1 y_1^3 \varphi_{2,0,1,0}[\eta] + y_1^3 (-\varphi_{2,0,0,0}[\eta] + \gamma \varphi_{2,0,1,0}[\eta]) - b_1 y_1^3 \varphi_{2,1,0,0}[\eta] - y_1^4 \varphi_{3,0,0,0}[\eta]\Big) - \\
& y_1 \Big(1 + \epsilon \Big(\varphi_{0,0,0,0}[\eta] + x_1 \varphi_{0,0,0,1}[\eta] + x_1^2 \varphi_{0,0,0,2}[\eta] + x_1^3 \varphi_{0,0,0,3}[\eta] + a_1 \varphi_{0,0,1,0}[\eta] + \\
& \qquad a_1 x_1 \varphi_{0,0,1,1}[\eta] + a_1 x_1^2 \varphi_{0,0,1,2}[\eta] + b_1 \varphi_{0,1,0,0}[\eta] + b_1 x_1 \varphi_{0,1,0,1}[\eta] + \\
& \qquad b_1 x_1^2 \varphi_{0,1,0,2}[\eta] + y_1 \varphi_{1,0,0,0}[\eta] + x_1 y_1 \varphi_{1,0,0,1}[\eta] + x_1^2 y_1 \varphi_{1,0,0,2}[\eta] + a_1 y_1 \varphi_{1,0,1,0}[\eta] + \\
& \qquad a_1 x_1 y_1 \varphi_{1,0,1,1}[\eta] + b_1 y_1 \varphi_{1,1,0,0}[\eta] + b_1 x_1 y_1 \varphi_{1,1,0,1}[\eta] + y_1^2 \varphi_{2,0,0,0}[\eta] + \\
& \qquad x_1 y_1^2 \varphi_{2,0,0,1}[\eta] + a_1 y_1^2 \varphi_{2,0,1,0}[\eta] + b_1 y_1^2 \varphi_{2,1,0,0}[\eta] + y_1^3 \varphi_{3,0,0,0}[\eta]\Big)\Big) + \\
& \epsilon \Big(\varphi_{0,0,0,0}'[\eta] + x_1 \varphi_{0,0,0,1}'[\eta] + x_1^2 \varphi_{0,0,0,2}'[\eta] + x_1^3 \varphi_{0,0,0,3}'[\eta] + a_1 \varphi_{0,0,1,0}'[\eta] + \\
& \quad a_1 x_1 \varphi_{0,0,1,1}'[\eta] + a_1 x_1^2 \varphi_{0,0,1,2}'[\eta] + b_1 \varphi_{0,1,0,0}'[\eta] + b_1 x_1 \varphi_{0,1,0,1}'[\eta] + \\
& \quad b_1 x_1^2 \varphi_{0,1,0,2}'[\eta] + y_1 \varphi_{1,0,0,0}'[\eta] + x_1 y_1 \varphi_{1,0,0,1}'[\eta] + x_1^2 y_1 \varphi_{1,0,0,2}'[\eta] + \\
& \quad a_1 y_1 \varphi_{1,0,1,0}'[\eta] + a_1 x_1 y_1 \varphi_{1,0,1,1}'[\eta] + b_1 y_1 \varphi_{1,1,0,0}'[\eta] + b_1 x_1 y_1 \varphi_{1,1,0,1}'[\eta] + \\
& \quad y_1^2 \varphi_{2,0,0,0}'[\eta] + x_1 y_1^2 \varphi_{2,0,0,1}'[\eta] + a_1 y_1^2 \varphi_{2,0,1,0}'[\eta] + b_1 y_1^2 \varphi_{2,1,0,0}'[\eta] + y_1^3 \varphi_{3,0,0,0}'[\eta]\Big)
\end{aligned}$$

In[ ]:= $\mathrm{CoefficientRules}[(\partial_\lambda F) + P0\, F - rhs,\ \{y_i, b_i, a_i, x_i\}]$

Out[ ]=
$$\begin{aligned}
& \{\{3, 0, 0, 0\} \to -\gamma \epsilon \varphi_{2,0,1,0}[\eta] + \epsilon \varphi_{3,0,0,0}'[\eta],\ \{2, 1, 0, 0\} \to \gamma \epsilon \varphi_{2,0,0,1}[\eta] + \epsilon \varphi_{2,1,0,0}'[\eta], \\
& \{2, 0, 1, 0\} \to \epsilon \varphi_{2,0,1,0}'[\eta],\ \{2, 0, 0, 1\} \to -\gamma \epsilon \varphi_{1,0,1,1}[\eta] + \epsilon \varphi_{2,0,0,1}'[\eta], \\
& \{2, 0, 0, 0\} \to -\gamma \epsilon \varphi_{1,0,1,0}[\eta] + \epsilon \varphi_{2,0,0,0}'[\eta],\ \{1, 2, 0, 0\} \to \gamma \epsilon \varphi_{1,1,0,1}[\eta], \\
& \{1, 1, 1, 0\} \to \gamma \epsilon \varphi_{1,0,1,1}[\eta],\ \{1, 1, 0, 1\} \to 2\gamma \epsilon \varphi_{1,0,0,2}[\eta] + \epsilon \varphi_{1,1,0,1}'[\eta], \\
& \{1, 1, 0, 0\} \to \gamma \epsilon \varphi_{1,0,0,1}[\eta] + \epsilon \varphi_{1,1,0,0}'[\eta],\ \{1, 0, 1, 1\} \to \epsilon \varphi_{1,0,1,1}'[\eta], \\
& \{1, 0, 1, 0\} \to \epsilon \varphi_{1,0,1,0}'[\eta],\ \{1, 0, 0, 2\} \to -\gamma \epsilon \varphi_{0,0,1,2}[\eta] + \epsilon \varphi_{1,0,0,2}'[\eta], \\
& \{1, 0, 0, 1\} \to -\gamma \epsilon \varphi_{0,0,1,1}[\eta] + \epsilon \varphi_{1,0,0,1}'[\eta],\ \{1, 0, 0, 0\} \to -\gamma \epsilon \varphi_{0,0,1,0}[\eta] + \epsilon \varphi_{1,0,0,0}'[\eta], \\
& \{0, 2, 0, 1\} \to 2\gamma \epsilon \varphi_{0,1,0,2}[\eta],\ \{0, 2, 0, 0\} \to \gamma \epsilon \varphi_{0,1,0,1}[\eta], \\
& \{0, 1, 1, 1\} \to 2\gamma \epsilon \varphi_{0,0,1,2}[\eta],\ \{0, 1, 1, 0\} \to \gamma \epsilon \varphi_{0,0,1,1}[\eta], \\
& \{0, 1, 0, 2\} \to 3\gamma \epsilon \varphi_{0,0,0,3}[\eta] + \epsilon \varphi_{0,1,0,2}'[\eta],\ \{0, 1, 0, 1\} \to 2\gamma \epsilon \varphi_{0,0,0,2}[\eta] + \epsilon \varphi_{0,1,0,1}'[\eta], \\
& \{0, 1, 0, 0\} \to \gamma \epsilon \varphi_{0,0,0,1}[\eta] + \epsilon \varphi_{0,1,0,0}'[\eta],\ \{0, 0, 1, 2\} \to \epsilon \varphi_{0,0,1,2}'[\eta], \\
& \{0, 0, 1, 1\} \to \epsilon \varphi_{0,0,1,1}'[\eta],\ \{0, 0, 1, 0\} \to \epsilon \varphi_{0,0,1,0}'[\eta],\ \{0, 0, 0, 3\} \to \epsilon \varphi_{0,0,0,3}'[\eta], \\
& \{0, 0, 0, 2\} \to \epsilon \varphi_{0,0,0,2}'[\eta],\ \{0, 0, 0, 1\} \to \epsilon \varphi_{0,0,0,1}'[\eta],\ \{0, 0, 0, 0\} \to \epsilon \varphi_{0,0,0,0}'[\eta]\}
\end{aligned}$$

In[]:=
```
atλ = (# == 0) & /@ Flatten@CoefficientList[(∂_λ F) + P0 F - rhs, {y_i, b_i, a_i, x_i}]
```

Out[]=
```
{∈ φ_{0,0,0,0}′[η] == 0, ∈ φ_{0,0,0,1}′[η] == 0, ∈ φ_{0,0,0,2}′[η] == 0, ∈ φ_{0,0,0,3}′[η] == 0, ∈ φ_{0,0,1,0}′[η] == 0,
 ∈ φ_{0,0,1,1}′[η] == 0, ∈ φ_{0,0,1,2}′[η] == 0, True, γ ∈ φ_{0,0,0,1}[η] + ∈ φ_{0,1,0,0}′[η] == 0,
 2 γ ∈ φ_{0,0,0,2}[η] + ∈ φ_{0,1,0,1}′[η] == 0, 3 γ ∈ φ_{0,0,0,3}[η] + ∈ φ_{0,1,0,2}′[η] == 0, True, γ ∈ φ_{0,0,1,1}[η] == 0,
 2 γ ∈ φ_{0,0,1,2}[η] == 0, True, True, γ ∈ φ_{0,1,0,1}[η] == 0, 2 γ ∈ φ_{0,1,0,2}[η] == 0, True, True,
 True, True, True, True, -∈ φ_{0,0,0,0}[η] - ∈ (-φ_{0,0,0,0}[η] + γ φ_{0,0,1,0}[η]) + ∈ φ_{1,0,0,0}′[η] == 0,
 -∈ φ_{0,0,0,1}[η] - ∈ (-φ_{0,0,0,1}[η] + γ φ_{0,0,1,1}[η]) + ∈ φ_{1,0,0,1}′[η] == 0,
 -∈ φ_{0,0,0,2}[η] - ∈ (-φ_{0,0,0,2}[η] + γ φ_{0,0,1,2}[η]) + ∈ φ_{1,0,0,2}′[η] == 0, True, ∈ φ_{1,0,1,0}′[η] == 0,
 ∈ φ_{1,0,1,1}′[η] == 0, True, True, -∈ φ_{0,1,0,0}[η] - ∈ (-φ_{0,1,0,0}[η] - γ φ_{1,0,0,1}[η]) + ∈ φ_{1,1,0,0}′[η] == 0,
 -∈ φ_{0,1,0,1}[η] - ∈ (-φ_{0,1,0,1}[η] - 2 γ φ_{1,0,0,2}[η]) + ∈ φ_{1,1,0,1}′[η] == 0, True, True,
 γ ∈ φ_{1,0,1,1}[η] == 0, True, True, True, γ ∈ φ_{1,1,0,1}[η] == 0, True, True, True, True,
 True, True, True, -∈ φ_{1,0,0,0}[η] - ∈ (-φ_{1,0,0,0}[η] + γ φ_{1,0,1,0}[η]) + ∈ φ_{2,0,0,0}′[η] == 0,
 -∈ φ_{1,0,0,1}[η] - ∈ (-φ_{1,0,0,1}[η] + γ φ_{1,0,1,1}[η]) + ∈ φ_{2,0,0,1}′[η] == 0, True, True, ∈ φ_{2,0,1,0}′[η] == 0,
 True, True, True, -∈ φ_{1,1,0,0}[η] - ∈ (-φ_{1,1,0,0}[η] - γ φ_{2,0,0,1}[η]) + ∈ φ_{2,1,0,0}′[η] == 0,
 True, True, True, True, True, True, True, True, True, True, True, True, True,
 True, True, -∈ φ_{2,0,0,0}[η] - ∈ (-φ_{2,0,0,0}[η] + γ φ_{2,0,1,0}[η]) + ∈ φ_{3,0,0,0}′[η] == 0,
 True, True, True, True, True, True, True, True, True, True, True, True,
 True, True, True, True, True, True, True, True, True, True, True}
```

In[]:=
```
DSolve[And @@ (at0 ⋃ atλ), φs, λ]
```

$Aborted DSolve: There are fewer dependent variables than equations, so the system is overdetermined.

Out[]=
```
DSolve[∈ φ_{0,0,0,0}[0] == 0 && ∈ φ_{0,0,0,1}[0] == 0 && ∈ φ_{0,0,0,2}[0] == 0 && ∈ φ_{0,0,0,3}[0] == 0 &&
  ∈ φ_{0,0,1,0}[0] == 0 && ∈ φ_{0,0,1,1}[0] == 0 && γ ∈ φ_{0,0,1,1}[η] == 0 && ∈ φ_{0,0,1,2}[0] == 0 &&
  2 γ ∈ φ_{0,0,1,2}[η] == 0 && ∈ φ_{0,1,0,0}[0] == 0 && ∈ φ_{0,1,0,1}[0] == 0 && γ ∈ φ_{0,1,0,1}[η] == 0 &&
  ∈ φ_{0,1,0,2}[0] == 0 && 2 γ ∈ φ_{0,1,0,2}[η] == 0 && ∈ φ_{1,0,0,0}[0] == 0 && ∈ φ_{1,0,0,1}[0] == 0 &&
  ∈ φ_{1,0,0,2}[0] == 0 && ∈ φ_{1,0,1,0}[0] == 0 && ∈ φ_{1,0,1,1}[0] == 0 && γ ∈ φ_{1,0,1,1}[η] == 0 &&
  ∈ φ_{1,1,0,0}[0] == 0 && ∈ φ_{1,1,0,1}[0] == 0 && γ ∈ φ_{1,1,0,1}[η] == 0 && ∈ φ_{2,0,0,0}[0] == 0 &&
  ∈ φ_{2,0,0,1}[0] == 0 && ∈ φ_{2,0,1,0}[0] == 0 && ∈ φ_{2,1,0,0}[0] == 0 && ∈ φ_{3,0,0,0}[0] == 0 &&
  ∈ φ_{0,0,0,0}′[η] == 0 && ∈ φ_{0,0,0,1}′[η] == 0 && ∈ φ_{0,0,0,2}′[η] == 0 && ∈ φ_{0,0,0,3}′[η] == 0 &&
  ∈ φ_{0,0,1,0}′[η] == 0 && ∈ φ_{0,0,1,1}′[η] == 0 && ∈ φ_{0,0,1,2}′[η] == 0 && γ ∈ φ_{0,0,0,1}[η] + ∈ φ_{0,1,0,0}′[η] == 0 &&
  2 γ ∈ φ_{0,0,0,2}[η] + ∈ φ_{0,1,0,1}′[η] == 0 && 3 γ ∈ φ_{0,0,0,3}[η] + ∈ φ_{0,1,0,2}′[η] == 0 &&
  -∈ φ_{0,0,0,0}[η] - ∈ (-φ_{0,0,0,0}[η] + γ φ_{0,0,1,0}[η]) + ∈ φ_{1,0,0,0}′[η] == 0 &&
  -∈ φ_{0,0,0,1}[η] - ∈ (-φ_{0,0,0,1}[η] + γ φ_{0,0,1,1}[η]) + ∈ φ_{1,0,0,1}′[η] == 0 &&
  -∈ φ_{0,0,0,2}[η] - ∈ (-φ_{0,0,0,2}[η] + γ φ_{0,0,1,2}[η]) + ∈ φ_{1,0,0,2}′[η] == 0 && ∈ φ_{1,0,1,0}′[η] == 0 &&
  ∈ φ_{1,0,1,1}′[η] == 0 && -∈ φ_{0,1,0,0}[η] - ∈ (-φ_{0,1,0,0}[η] - γ φ_{1,0,0,1}[η]) + ∈ φ_{1,1,0,0}′[η] == 0 &&
  -∈ φ_{0,1,0,1}[η] - ∈ (-φ_{0,1,0,1}[η] - 2 γ φ_{1,0,0,2}[η]) + ∈ φ_{1,1,0,1}′[η] == 0 &&
  -∈ φ_{1,0,0,0}[η] - ∈ (-φ_{1,0,0,0}[η] + γ φ_{1,0,1,0}[η]) + ∈ φ_{2,0,0,0}′[η] == 0 &&
  -∈ φ_{1,0,0,1}[η] - ∈ (-φ_{1,0,0,1}[η] + γ φ_{1,0,1,1}[η]) + ∈ φ_{2,0,0,1}′[η] == 0 &&
  ∈ φ_{2,0,1,0}′[η] == 0 && -∈ φ_{1,1,0,0}[η] - ∈ (-φ_{1,1,0,0}[η] - γ φ_{2,0,0,1}[η]) + ∈ φ_{2,1,0,0}′[η] == 0 &&
  -∈ φ_{2,0,0,0}[η] - ∈ (-φ_{2,0,0,0}[η] + γ φ_{2,0,1,0}[η]) + ∈ φ_{3,0,0,0}′[η] == 0,
 {φ_{0,0,0,0}[η], φ_{0,0,0,1}[η], φ_{0,0,0,2}[η], φ_{0,0,0,3}[η], φ_{1,0,0,0}[η], φ_{1,0,0,1}[η], φ_{1,0,0,2}[η],
  φ_{2,0,0,0}[η], φ_{2,0,0,1}[η], φ_{3,0,0,0}[η], φ_{0,0,1,0}[η], φ_{0,0,1,1}[η], φ_{0,0,1,2}[η], φ_{1,0,1,0}[η], φ_{1,0,1,1}[η],
  φ_{2,0,1,0}[η], φ_{0,1,0,0}[η], φ_{0,1,0,1}[η], φ_{0,1,0,2}[η], φ_{1,1,0,0}[η], φ_{1,1,0,1}[η], φ_{2,1,0,0}[η]}, η]
```

In[∘]:=
```
DSolve[And @@ (at0 ⋃ atλ) /. ϵ → 1, φs, λ]
```

DSolve: There are fewer dependent variables than equations, so the system is overdetermined.

Out[∘]=

$$\text{DSolve}[\varphi_{0,0,0,0}[0] == 0 \,\&\&\, \varphi_{0,0,0,1}[0] == 0 \,\&\&\, \varphi_{0,0,0,2}[0] == 0 \,\&\&\, \varphi_{0,0,0,3}[0] == 0 \,\&\&\, \varphi_{0,0,1,0}[0] == 0 \,\&\&$$
$$\varphi_{0,0,1,1}[0] == 0 \,\&\&\, \gamma\,\varphi_{0,0,1,1}[\eta] == 0 \,\&\&\, \varphi_{0,0,1,2}[0] == 0 \,\&\&\, 2\,\gamma\,\varphi_{0,0,1,2}[\eta] == 0 \,\&\&\, \varphi_{0,1,0,0}[0] == 0 \,\&\&$$
$$\varphi_{0,1,0,1}[0] == 0 \,\&\&\, \gamma\,\varphi_{0,1,0,1}[\eta] == 0 \,\&\&\, \varphi_{0,1,0,2}[0] == 0 \,\&\&\, 2\,\gamma\,\varphi_{0,1,0,2}[\eta] == 0 \,\&\&$$
$$\varphi_{1,0,0,0}[0] == 0 \,\&\&\, \varphi_{1,0,0,1}[0] == 0 \,\&\&\, \varphi_{1,0,0,2}[0] == 0 \,\&\&\, \varphi_{1,0,1,0}[0] == 0 \,\&\&\, \varphi_{1,0,1,1}[0] == 0 \,\&\&$$
$$\gamma\,\varphi_{1,0,1,1}[\eta] == 0 \,\&\&\, \varphi_{1,1,0,0}[0] == 0 \,\&\&\, \varphi_{1,1,0,1}[0] == 0 \,\&\&\, \gamma\,\varphi_{1,1,0,1}[\eta] == 0 \,\&\&\, \varphi_{2,0,0,0}[0] == 0 \,\&\&$$
$$\varphi_{2,0,0,1}[0] == 0 \,\&\&\, \varphi_{2,0,1,0}[0] == 0 \,\&\&\, \varphi_{2,1,0,0}[0] == 0 \,\&\&\, \varphi_{3,0,0,0}[0] == 0 \,\&\&\, \varphi_{0,0,0,0}'[\eta] == 0 \,\&\&$$
$$\varphi_{0,0,0,1}'[\eta] == 0 \,\&\&\, \varphi_{0,0,0,2}'[\eta] == 0 \,\&\&\, \varphi_{0,0,0,3}'[\eta] == 0 \,\&\&\, \varphi_{0,0,1,0}'[\eta] == 0 \,\&\&\, \varphi_{0,0,1,1}'[\eta] == 0 \,\&\&$$
$$\varphi_{0,0,1,2}'[\eta] == 0 \,\&\&\, \gamma\,\varphi_{0,0,0,1}[\eta] + \varphi_{0,1,0,0}'[\eta] == 0 \,\&\&\, 2\,\gamma\,\varphi_{0,0,0,2}[\eta] + \varphi_{0,1,0,1}'[\eta] == 0 \,\&\&$$
$$3\,\gamma\,\varphi_{0,0,0,3}[\eta] + \varphi_{0,1,0,2}'[\eta] == 0 \,\&\&\, -\gamma\,\varphi_{0,0,1,0}[\eta] + \varphi_{1,0,0,0}'[\eta] == 0 \,\&\&$$
$$-\gamma\,\varphi_{0,0,1,1}[\eta] + \varphi_{1,0,0,1}'[\eta] == 0 \,\&\&\, -\gamma\,\varphi_{0,0,1,2}[\eta] + \varphi_{1,0,0,2}'[\eta] == 0 \,\&\&\, \varphi_{1,0,1,0}'[\eta] == 0 \,\&\&$$
$$\varphi_{1,0,1,1}'[\eta] == 0 \,\&\&\, \gamma\,\varphi_{1,0,0,1}[\eta] + \varphi_{1,1,0,0}'[\eta] == 0 \,\&\&\, 2\,\gamma\,\varphi_{1,0,0,2}[\eta] + \varphi_{1,1,0,1}'[\eta] == 0 \,\&\&$$
$$-\gamma\,\varphi_{1,0,1,0}[\eta] + \varphi_{2,0,0,0}'[\eta] == 0 \,\&\&\, -\gamma\,\varphi_{1,0,1,1}[\eta] + \varphi_{2,0,0,1}'[\eta] == 0 \,\&\&$$
$$\varphi_{2,0,1,0}'[\eta] == 0 \,\&\&\, \gamma\,\varphi_{2,0,0,1}[\eta] + \varphi_{2,1,0,0}'[\eta] == 0 \,\&\&\, -\gamma\,\varphi_{2,0,1,0}[\eta] + \varphi_{3,0,0,0}'[\eta] == 0,$$
$$\{\varphi_{0,0,0,0}[\eta],\, \varphi_{0,0,0,1}[\eta],\, \varphi_{0,0,0,2}[\eta],\, \varphi_{0,0,0,3}[\eta],\, \varphi_{1,0,0,0}[\eta],\, \varphi_{1,0,0,1}[\eta],\, \varphi_{1,0,0,2}[\eta],$$
$$\varphi_{2,0,0,0}[\eta],\, \varphi_{2,0,0,1}[\eta],\, \varphi_{3,0,0,0}[\eta],\, \varphi_{0,0,1,0}[\eta],\, \varphi_{0,0,1,1}[\eta],\, \varphi_{0,0,1,2}[\eta],\, \varphi_{1,0,1,0}[\eta],\, \varphi_{1,0,1,1}[\eta],$$
$$\varphi_{2,0,1,0}[\eta],\, \varphi_{0,1,0,0}[\eta],\, \varphi_{0,1,0,1}[\eta],\, \varphi_{0,1,0,2}[\eta],\, \varphi_{1,1,0,0}[\eta],\, \varphi_{1,1,0,1}[\eta],\, \varphi_{2,1,0,0}[\eta]\},\, \eta]$$