

```

In[ ]:= M1 = {
    {ℓ c, -c b},
    {α b (1 + ℓ c), -α Subscript[r, y] - c b^2 α}
};
M1 // MatrixForm
{vals, vecs} = Eigensystem[M1];
vals[[2]] (* Eigenvalue of M1 *)
{1, vecs[[2]] [[2]] / vecs[[2]] [[1]]} (* Corresponding eigenvector *)
Out[ ]//MatrixForm=

$$\begin{pmatrix} c \ell & -b c \\ b (1 + c \ell) \alpha & -b^2 c \alpha - \alpha r_y \end{pmatrix}$$

Out[ ]:=

$$\frac{1}{2} \left( c \ell - b^2 c \alpha - \alpha r_y + \sqrt{(-c \ell + b^2 c \alpha + \alpha r_y)^2 - 4 (b^2 c \alpha - c \ell \alpha r_y)} \right)$$

Out[ ]:=

$$\left\{ 1, -\frac{2 b (1 + c \ell) \alpha}{-c \ell - b^2 c \alpha - \alpha r_y - \sqrt{c^2 \ell^2 - 4 b^2 c \alpha - 2 b^2 c^2 \ell \alpha + b^4 c^2 \alpha^2 + 2 c \ell \alpha r_y + 2 b^2 c \alpha^2 r_y + \alpha^2 r_y^2}} \right\}$$

In[ ]:= A1 = -α * Subscript[r, y] - 3 * ℓ * c * α * Subscript[r, y] + ℓ * c;
B1 = 2 * ℓ * c * α * Subscript[r, y];
F1 = c^2 * ℓ^2 - 4 * b^2 * c * α -
    2 * b^2 * c^2 * ℓ * α + b^4 * c^2 * α^2 + 2 * c * ℓ * α * Subscript[r, y] +
    2 * b^2 * c * α^2 * Subscript[r, y] + α^2 * Subscript[r, y]^2;
Simplify[A1^2 - 4 B1 - F1 /. {b → Sqrt[3 ℓ Subscript[r, y]]}]
(* Check that F1 = A1^2 - 4B1. *)
Out[ ]:=
0

```