In[525]:=
```
MQF[f_] := {{
   1, 0}, {
   1/f, 1}}
MQD[f_] := {{
   1, 0}, {
   -1/f, 1}}
MDrift[s_] := {{
   1, s}, {
   0, 1}}

MFodoHalfx[fQF_, fQD_, s1_, s2_] := MQF[fQF].MDrift[s1].MQD[fQD].MDrift[s2]
MFodox[fQF_, fQD_, s1_, s2_] :=
 MFodoHalfx[fQF, fQD, s1, s2].MDrift[s2].MQD[fQD].MDrift[s1].MQF[fQF]
MFodoHalfy[fQF_, fQD_, s1_, s2_] := MQD[fQD].MDrift[s1].MQF[fQF].MDrift[s2]
MFodoy[fQF_, fQD_, s1_, s2_] :=
 MFodoHalfy[fQF, fQD, s1, s2].MDrift[s2].MQF[fQF].MDrift[s1].MQD[fQD]
gamma[alpha_, beta_] := (1 + alpha^2)/beta
MKSHalfx[fQF_, fQD_, s1_, s2_] := {{
   MFodoHalfx[fQF, fQD, s1, s2][[1, 1]]^2, -2*MFodoHalfx[fQF, fQD, s1, s2][[1, 1]]*
    MFodoHalfx[fQF, fQD, s1, s2][[1, 2]], MFodoHalfx[fQF, fQD, s1, s2][[1, 2]]^2},
  {-MFodoHalfx[fQF, fQD, s1, s2][[1, 1]]*MFodoHalfx[fQF, fQD, s1, s2][[2, 1]],
   MFodoHalfx[fQF, fQD, s1, s2][[1, 1]]*MFodoHalfx[fQF, fQD, s1, s2][[2, 2]] +
    MFodoHalfx[fQF, fQD, s1, s2][[1, 2]]*MFodoHalfx[fQF, fQD, s1, s2][[2, 1]],
   -MFodoHalfx[fQF, fQD, s1, s2][[2, 2]]*MFodoHalfx[fQF, fQD, s1, s2][[1, 2]]},
  {MFodoHalfx[fQF, fQD, s1, s2][[2, 1]]^2, -2*MFodoHalfx[fQF, fQD, s1, s2][[2, 2]]*
    MFodoHalfx[fQF, fQD, s1, s2][[2, 1]], MFodoHalfx[fQF, fQD, s1, s2][[2, 2]]^2
  }}
MKSx[fQF_, fQD_, s1_, s2_] := {{
   MFodox[fQF, fQD, s1, s2][[1, 1]]^2, -2*MFodox[fQF, fQD, s1, s2][[1, 1]]*
    MFodox[fQF, fQD, s1, s2][[1, 2]], MFodox[fQF, fQD, s1, s2][[1, 2]]^2},
  {-MFodox[fQF, fQD, s1, s2][[1, 1]]*MFodox[fQF, fQD, s1, s2][[2, 1]],
   MFodox[fQF, fQD, s1, s2][[1, 1]]*MFodox[fQF, fQD, s1, s2][[2, 2]] +
    MFodox[fQF, fQD, s1, s2][[1, 2]]*MFodox[fQF, fQD, s1, s2][[2, 1]],
   -MFodox[fQF, fQD, s1, s2][[2, 2]]*MFodox[fQF, fQD, s1, s2][[1, 2]]},
  {MFodox[fQF, fQD, s1, s2][[2, 1]]^2, -2*MFodox[fQF, fQD, s1, s2][[2, 2]]*
    MFodox[fQF, fQD, s1, s2][[2, 1]], MFodox[fQF, fQD, s1, s2][[2, 2]]^2
  }}
MKSHalfy[fQF_, fQD_, s1_, s2_] := {{
   MFodoHalfy[fQF, fQD, s1, s2][[1, 1]]^2, -2*MFodoHalfy[fQF, fQD, s1, s2][[1, 1]]*
    MFodoHalfy[fQF, fQD, s1, s2][[1, 2]], MFodoHalfy[fQF, fQD, s1, s2][[1, 2]]^2},
  {-MFodoHalfy[fQF, fQD, s1, s2][[1, 1]]*MFodoHalfy[fQF, fQD, s1, s2][[2, 1]],
   MFodoHalfy[fQF, fQD, s1, s2][[1, 1]]*MFodoHalfy[fQF, fQD, s1, s2][[2, 2]] +
    MFodoHalfy[fQF, fQD, s1, s2][[1, 2]]*MFodoHalfy[fQF, fQD, s1, s2][[2, 1]],
```

```
    -MFodoHalfy[fQF, fQD, s1, s2][[2, 2]] * MFodoHalfy[fQF, fQD, s1, s2][[1, 2]]},
   {MFodoHalfy[fQF, fQD, s1, s2][[2, 1]]^2, -2 * MFodoHalfy[fQF, fQD, s1, s2][[2, 2]] *
     MFodoHalfy[fQF, fQD, s1, s2][[2, 1]], MFodoHalfy[fQF, fQD, s1, s2][[2, 2]]^2
   }}
MKSy[fQF_, fQD_, s1_, s2_] := {{
    MFodoy[fQF, fQD, s1, s2][[1, 1]]^2, -2 * MFodoy[fQF, fQD, s1, s2][[1, 1]] *
     MFodoy[fQF, fQD, s1, s2][[1, 2]], MFodoy[fQF, fQD, s1, s2][[1, 2]]^2},
   {-MFodoy[fQF, fQD, s1, s2][[1, 1]] * MFodoy[fQF, fQD, s1, s2][[2, 1]],
    MFodoy[fQF, fQD, s1, s2][[1, 1]] * MFodoy[fQF, fQD, s1, s2][[2, 2]] +
     MFodoy[fQF, fQD, s1, s2][[1, 2]] * MFodoy[fQF, fQD, s1, s2][[2, 1]],
    -MFodoy[fQF, fQD, s1, s2][[2, 2]] * MFodoy[fQF, fQD, s1, s2][[1, 2]]},
   {MFodoy[fQF, fQD, s1, s2][[2, 1]]^2, -2 * MFodoy[fQF, fQD, s1, s2][[2, 2]] *
     MFodoy[fQF, fQD, s1, s2][[2, 1]], MFodoy[fQF, fQD, s1, s2][[2, 2]]^2
   }}
Mbeta0[alpha_, beta_] := {{
    beta, -alpha},
   {-alpha, gamma[alpha, beta]
   }}
MbetaHalfx[fQF_, fQD_, s1_, s2_, alpha_, beta_] :=
  (MFodoHalfx[fQF, fQD, s1, s2].Mbeta0[alpha, beta]).
   Transpose[MFodoHalfx[fQF, fQD, s1, s2]]
Mbetax[fQF_, fQD_, s1_, s2_, alpha_, beta_] :=
 MFodox[fQF, fQD, s1, s2].Mbeta0[alpha, beta].Transpose[MFodox[fQF, fQD, s1, s2]]
MbetaHalfy[fQF_, fQD_, s1_, s2_, alpha_, beta_] :=
  (MFodoHalfy[fQF, fQD, s1, s2].Mbeta0[alpha, beta]).
   Transpose[MFodoHalfy[fQF, fQD, s1, s2]]
Mbetay[fQF_, fQD_, s1_, s2_, alpha_, beta_] :=
 MFodoy[fQF, fQD, s1, s2].Mbeta0[alpha, beta].Transpose[MFodoy[fQF, fQD, s1, s2]]
MFunc[beta0_, beta_, alpha00_, alpha_, phi_] := {{
    Sqrt[beta / beta0] * (Cos[phi] + alpha0 * Sin[phi]), Sqrt[beta * beta0] * Sin[phi]},
   {((alpha00 - alpha) * Cos[phi] - (1 + alpha00 * alpha) * Sin[phi] / Sqrt[beta * beta0]),
    Sqrt[beta0 / beta] * (Cos[phi] - alpha * Sin[phi])}}

D0 = 10;
Ds = 0.05 * D0;
alpha0 = 0;
alphaHalf = 0;
alphaEnd = 0;
phase = 150 * Pi / 180.;
NSolve[MFodoy[fQF, fQD, Ds, D0][[1, 1]] == Cos[phase] &&
  MFodoy[fQF, fQD, Ds, D0][[1, 2]] == beta * Sin[phase] , {fQF, fQD}]
```

Solve: Solve was unable to solve the system with inexact coefficients. The answer was obtained by solving a corresponding exact system and numericizing the result.

Out[549]=

$$\left\{\left\{\text{fQF} \to \frac{0.5\left(41.-1.\sqrt{1.+40.\,\text{beta}}\right)}{-42.+\text{beta}},\ \text{fQD} \to \left(2.93545\times 10^{7}\right.\right.\right.$$
$$\left(-2.35623\times 10^{9}\,\text{beta}-\frac{1.01097\times 10^{11}\,\text{beta}}{-42.+\text{beta}}+5.8709\times 10^{7}\,\text{beta}^2+\frac{2.40707\times 10^{9}\,\text{beta}^2}{-42.+\text{beta}}+\right.$$
$$\left.\left.\left.\frac{2.46578\times 10^{9}\,\text{beta}\sqrt{1.+40.\,\text{beta}}}{-42.+\text{beta}}-\frac{5.8709\times 10^{7}\,\text{beta}^2\sqrt{1.+40.\,\text{beta}}}{-42.+\text{beta}}\right)\right)\Big/$$
$$\left.\left(-8.61688\times 10^{14}-1.319\times 10^{17}\,\text{beta}+3.44675\times 10^{15}\,\text{beta}^2\right)\right\},$$
$$\left\{\text{fQF} \to \frac{0.5\left(41.+\sqrt{1.+40.\,\text{beta}}\right)}{-42.+\text{beta}},\ \text{fQD} \to \left(2.93545\times 10^{7}\right.\right.$$
$$\left(-2.35623\times 10^{9}\,\text{beta}-\frac{1.01097\times 10^{11}\,\text{beta}}{-42.+\text{beta}}+5.8709\times 10^{7}\,\text{beta}^2+\frac{2.40707\times 10^{9}\,\text{beta}^2}{-42.+\text{beta}}-\right.$$
$$\left.\left.\left.\frac{2.46578\times 10^{9}\,\text{beta}\sqrt{1.+40.\,\text{beta}}}{-42.+\text{beta}}+\frac{5.8709\times 10^{7}\,\text{beta}^2\sqrt{1.+40.\,\text{beta}}}{-42.+\text{beta}}\right)\right)\Big/$$
$$\left.\left.\left(-8.61688\times 10^{14}-1.319\times 10^{17}\,\text{beta}+3.44675\times 10^{15}\,\text{beta}^2\right)\right\}\right\}$$

$$\left\{\left\{\text{Cos}[\text{omega}]^2\,\text{Cosh}[\text{omega}],\ \frac{\text{l}^2\,\text{Sin}[\text{omega}]^2\,\text{Sinh}[\text{omega}]}{\text{Abs}[\text{k}]^{3/2}},\ 0,\ 0\right\},\right.$$
$$\{0,\ \text{Cos}[\text{omega}]^2\,\text{Cosh}[\text{omega}],\ 0,\ 0\},$$
$$\left\{0,\ 0,\ \text{Cos}[\text{omega}]\,\text{Cosh}[\text{omega}]^2,\ \frac{\text{l}^2\,\text{Sin}[\text{omega}]\,\text{Sinh}[\text{omega}]^2}{\text{Abs}[\text{k}]^{3/2}}\right\},$$
$$\left.\{0,\ 0,\ 0,\ \text{Cos}[\text{omega}]\,\text{Cosh}[\text{omega}]^2\}\right\}$$