```
SterProj[{{z1_, z2_}, {w1_, w2_}}] := {z1/(Sqrt[2] - w2), z2/(Sqrt[2] - w2), w1/(Sqrt[2] - w2)};
knotpairs = {ξ Exp[q I θ], η Exp[p I θ + π I/q]};
Factor[ComplexExpand[{Re[#], Im[#]} & /@ (knotpairs /. {q → 2, p → 3, ξ → 1, η → 1})]];
SterProj[%];
knotplot = ParametricPlot3D[%, {θ, 0, 2 π}, Boxed → False, Axes → False]
```

```
knotpoly = z^2 + w^3 /. {z → zr + I zi, w → wr + I wi}
```

```
ComplexExpand[{Re[knotpoly], Im[knotpoly]}]
```

```
# == 0 & /@ ComplexExpand[{Re[knotpoly], Im[knotpoly]}]
```

```
InverseStereographicProjection = {zr → 4 zr/(zr^2 + zi^2 + wr^2 + 2), zi → 4 zi/(zr^2 + zi^2 + wr^2 + 2),
  wr → 4 wr/(zr^2 + zi^2 + wr^2 + 2), wi → Sqrt[2] (zr^2 + zi^2 + wr^2 - 2)/(zr^2 + zi^2 + wr^2 + 2)}
(*InverseStereographicProjection={zr→2zr/(zr^2+zi^2+wr^2+1),
  zi→2zi/(zr^2+zi^2+wr^2+1),wr→2wr/(zr^2+zi^2+wr^2+1),wi→(zr^2+zi^2+wr^2-1)/(zr^2+zi^2+wr^2+1)}*)
```

```
Factor[ComplexExpand[{Re[knotpoly], Im[knotpoly]}] /. InverseStereographicProjection]
{f, g} = Simplify[% * (2 + wr^2 + zi^2 + zr^2)^3]
```

```
function = Cos[θ] f + Sin[θ] g /. θ → Pi/2
```

```
Show[ContourPlot3D[{function == 0}, {zr, -4, 4},
  {zi, -4, 4}, {wr, -4, 4}, PlotPoints → 40, Mesh → False,
  Boxed → False, Axes → False], knotplot, ViewPoint → {5, 0, 0}]
```

```
zr^2 + zi^2 + wr^2 + wi^2 == 1
```

```
{zr^2 + zi^2 + wr^2 + wi^2 == 1, -3 wi^2 wr + wr^3 - zi^2 + zr^2 == 0, -wi^3 + 3 wi wr^2 + 2 zi zr == 0}
```

```
Solve[{wi^2 + wr^2 + zi^2 + zr^2 == 1,
  -3 wi^2 wr + wr^3 - zi^2 + zr^2 == 0, -wi^3 + 3 wi wr^2 + 2 zi zr == 0}, {wi, wr, zi, zr}]
```

```
{wi^2 + wr^2 + zi^2 + zr^2 == Sqrt[2], -3 wi^2 wr + wr^3 - zi^2 + zr^2 == 0, -wi^3 + 3 wi wr^2 + 2 zi zr == 0} /.
 InverseStereographicProjection
```

```
Solve[%23, {wr, zi, zr}]
```

```
Solve[%14, {wr, zi, zr}]
```

```
RegionPlot3D[cond, {zr, -100, 100}, {zi, -100, 100}, {wr, -100, 100}]
```

```
cond = (wi^2 + wr^2 + zi^2 + zr^2 == 1 && -3 wi^2 wr + wr^3 - zi^2 + zr^2 == 0 && -wi^3 + 3 wi wr^2 + 2 zi zr == 0) /.
  InverseStereographicProjection
```

```
Solve[cond, {wr, zi, zr}]
```

```
Simplify[cond]
```

```
Solve[%43, {wr, zi, zr}]
```

```
Simplify[Factor[# == 0 & /@ ComplexExpand[{Re[knotpoly], Im[knotpoly]}] /.
   InverseStereographicProjection]]
```

```
cond =
 1/(1 + wr^2 + zi^2 + zr^2) (3 wr^5 + 2 wr^2 (zi^2 - zr^2) + 3 wr (-1 + zi^2 + zr^2)^2 + 2 wr^3 (-5 + 3 zi^2 + 3 zr^2) + 2
          (zi^2 + zi^4 - zr^2 (1 + zr^2))) == 0 && 1/(1 + wr^2 + zi^2 + zr^2)
     (wr^6 + zi^6 - 8 zi^3 zr + 3 zi^4 (-1 + zr^2) + 3 zi^2 (-1 + zr^2)^2 + (-1 + zr^2)^3 + 3 wr^4 (-5 + zi^2 + zr^2) -
        8 zi (zr + zr^3) + wr^2 (3 zi^4 - 8 zi zr + 6 zi^2 (-3 + zr^2) + 3 (5 - 6 zr^2 + zr^4))) == 0 &&
   (wi^2 + wr^2 + zi^2 + zr^2) == 1 /. InverseStereographicProjection
```

```
cond = {wi^2 + wr^2 + zi^2 + zr^2 == Sqrt[2], -3 wi^2 wr + wr^3 - zi^2 + zr^2 == 0,
   -wi^3 + 3 wi wr^2 + 2 zi zr == 0} /. InverseStereographicProjection
```

```
# == 0 & /@ eqns
```

```
# == 0 & /@ eqns
```

```
-8 (3 wr^5 + 2 wr^2 (zi^2 - zr^2) + 3 wr (-2 + zi^2 + zr^2)^2 +
      wr^3 (-20 + 6 zi^2 + 6 zr^2) + 2 (2 zi^2 + zi^4 - zr^2 (2 + zr^2))) == 0 &&
 -2 (Sqrt[2] wr^6 + Sqrt[2] zi^6 - 16 zi^3 zr + 3 Sqrt[2] zi^4 (-2 + zr^2) + 3 Sqrt[2] zi^2 (-2 + zr^2)^2 +
      Sqrt[2] (-2 + zr^2)^3 - 16 zi zr (2 + zr^2) + 3 Sqrt[2] wr^4 (-10 + zi^2 + zr^2) +
      wr^2 (3 Sqrt[2] zi^4 - 16 zi zr + 6 Sqrt[2] zi^2 (-6 + zr^2) + 3 Sqrt[2] (20 - 12 zr^2 + zr^4))) == 0
```

```
RegionPlot3D[-8 (3 wr^5 + 2 wr^2 (zi^2 - zr^2) + 3 wr (-2 + zi^2 + zr^2)^2 +
       wr^3 (-20 + 6 zi^2 + 6 zr^2) + 2 (2 zi^2 + zi^4 - zr^2 (2 + zr^2))) == 0 &&
  -2 (Sqrt[2] wr^6 + Sqrt[2] zi^6 - 16 zi^3 zr + 3 Sqrt[2] zi^4 (-2 + zr^2) + 3 Sqrt[2] zi^2 (-2 + zr^2)^2 +
       Sqrt[2] (-2 + zr^2)^3 - 16 zi zr (2 + zr^2) + 3 Sqrt[2] wr^4 (-10 + zi^2 + zr^2) +
       wr^2 (3 Sqrt[2] zi^4 - 16 zi zr + 6 Sqrt[2] zi^2 (-6 + zr^2) + 3 Sqrt[2] (20 - 12 zr^2 + zr^4))) == 0,
 {zr, -1, 1}, {zi, -1, 1}, {wr, -1, 1}]
```

```
ParametricPlot3D[
 {0.5 Cos[2 θ]/(1 - 0.5 Cos[3 θ]), 0.5 Sin[2 θ]/(1 - 0.5 Cos[3 θ]), -0.5 Sin[3 θ]/(1 - 0.5 Cos[3 θ])}, {θ, -26.3894, 26.3894}]
```

```
RegionPlot3D@ImplicitRegion[0.8 < x^2 + y^2 + z^2 < 1 && x > 0, {x, y, z}]
```

```
ExpToTrig[Exp[I x]]
```