

```
{z, w} = {Exp[I α] Sin[γ], Exp[I β] Cos[γ]};
SterProj[{z_, w_}] :=
Module[{x = Re[z], y = Im[z], u = Re[w], v = Im[w]}, { $\frac{x}{1-v}$ ,  $\frac{y}{1-v}$ ,  $\frac{u}{1-v}$ } // ComplexExpand]
σ[{z_, w_}] := {w, z}
```

```
ZW[γ_, α_, β_] := {Exp[I α] Sin[γ], Exp[I β] Cos[γ]}
```

```
Show[ParametricPlot3D[SterProj@ZW[π/4, α, β],
{α, 0, 2π}, {β, 0, 2π}, PlotStyle → Opacity[0.4], MeshStyle → None],
ParametricPlot3D[SterProj@ZW[π/4, θ, q/p θ], {θ, 0, p 2π}]]
```

```
p = 3;
q = 5;
```

```
m = p / q;
m2 = q / p;
f2[x_] :=
Piecewise[
Flatten[Table[{{m (x - 2 π k / p) - π / (2 q), 2 k π / p ≤ x ≤ (2 k + 1) π / p}, {-m (x - 2 π k / p) +
2 π / q - π / (2 q), (2 k + 1) π / p ≤ x ≤ (2 k + 2) π / p}}, {k, 0, p}], {1, 2}]]
```

```
g2[x_] :=
Piecewise[Flatten[
Table[{{m2 (x - 2 π k / q) - π / (2 p), 2 k π / q ≤ x ≤ (2 k + 1) π / q}, {-m2 (x - 2 π k / q) +
2 π / p - π / (2 p), (2 k + 1) π / q ≤ x ≤ (2 k + 2) π / q}}, {k, 0, q}], {1, 2}]]
```

```
plotjunk = Abs[4 / π γ]^4 f2[β] + 2 π n / q /. n → 0;
Show[ParametricPlot3D[SterProj@ZW[π/4, α, β],
{α, 0, 2π}, {β, 0, 2π}, PlotStyle → Opacity[0.2], MeshStyle → None],
ParametricPlot3D[SterProj@ZW[π/4, θ, p/q θ], {θ, 0, q 2π}],
ParametricPlot3D[SterProj@ZW[γ, β - π / (p 2), plotjunk], {γ, 0, π/4}, {β, 0, 2π}]]
```

```
plotjunk = Abs[4 / π γ]^4 g2[α] + 2 π n / p /. n → 0;
Show[ParametricPlot3D[SterProj@ZW[π/4, α, β], {α, 0, 2π}, {β, 0, 2π},
PlotStyle → Opacity[0.2], MeshStyle → None, PlotRange → {{-4, 4}, {-4, 4}, {-3, 3}}],
ParametricPlot3D[SterProj@ZW[π/4, θ, p/q θ], {θ, 0, q 2π}],
ParametricPlot3D[SterProj@ZW[γ, plotjunk, α - π / (q 2)],
{γ, 0, π/4}, {α, 0, 2π}, PlotPoints → 55, MeshStyle → None]]
```

```
Show[ParametricPlot3D[SterProj@ZW[ $\pi/4$ ,  $\alpha$ ,  $\beta$ ],
  { $\alpha$ , 0, 2  $\pi$ }, { $\beta$ , 0, 2  $\pi$ }, PlotStyle -> Opacity[0.2], MeshStyle -> None],
ParametricPlot3D[SterProj@ZW[ $\pi/4$ ,  $\theta$ ,  $p/q \theta$ ], { $\theta$ , 0,  $q 2 \pi$ }],
ParametricPlot3D[SterProj@ $\sigma$ @ZW[ $\gamma$ ,  $\beta - \pi/(q^2)$ , inside], { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Blue, PlotPoints -> 50],
ParametricPlot3D[SterProj@ZW[ $\gamma$ ,  $\beta - \pi/(p^2)$ , outside], { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Orange, PlotPoints -> 50]]

inside = Abs[4 /  $\pi \gamma$ ]^4 g2[ $\beta$ ] + 2  $\pi n / p$ ;
outside = Abs[4 /  $\pi \gamma$ ]^4 f2[ $\beta$ ] + 2  $\pi n / q$ ;

insidewashers = Table[SterProj@ZW[ $\gamma$ ,  $\beta - \pi/(q^2)$ , inside], {n, 0, 2}];
insideplot = ParametricPlot3D[insidewashers, { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Blue, Exclusions -> None];

outsidewashers = Table[SterProj@ $\sigma$ @ZW[ $\gamma$ ,  $\beta - \pi/(p^2)$ , outside], {n, 0, 4}];
outsideplot = ParametricPlot3D[outsidewashers, { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Orange, Exclusions -> None];

torus = ParametricPlot3D[SterProj@ZW[ $\pi/4$ ,  $\alpha$ ,  $\beta$ ],
  { $\alpha$ , 0, 2  $\pi$ }, { $\beta$ , 0, 2  $\pi$ }, PlotStyle -> Opacity[0.2], MeshStyle -> None,
  PlotRange -> {{-3, 3}, {-3, 3}, {-3, 3}}, Axes -> False, Boxed -> False];

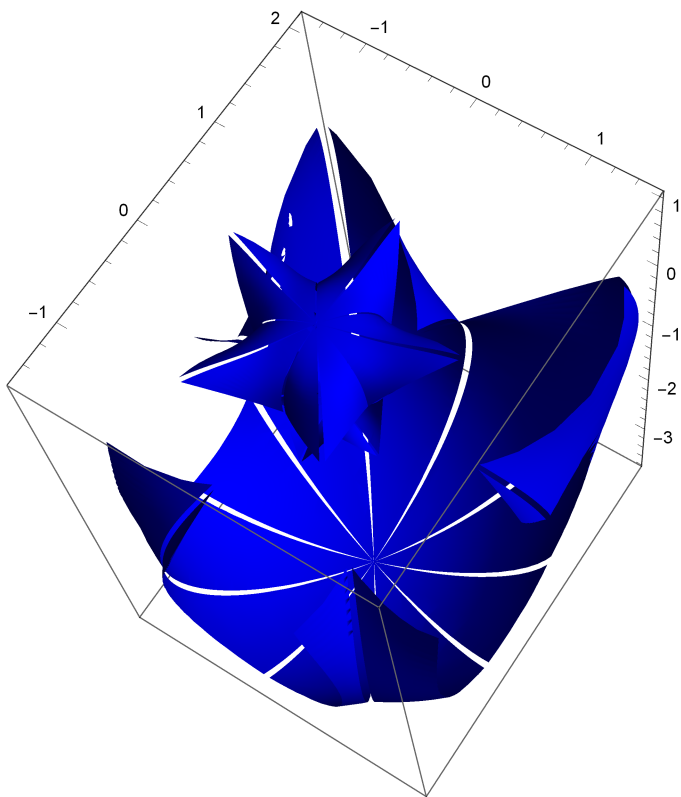
knot = ParametricPlot3D[RotationTransform[ $\pi/q$ , {0, 0, 1}]@
  SterProj@ $\sigma$ @ZW[ $\pi/4$ ,  $\theta$ ,  $-p/q \theta$ ], { $\theta$ , 0,  $q 2 \pi$ }, PlotStyle -> {Thick, Green}];

Show[torus, knot, insideplot, outsideplot]

Show[{ParametricPlot3D[SterProj@ZW[ $\pi/4$ ,  $\alpha$ ,  $\beta$ ],
  { $\alpha$ , 0, 2  $\pi$ }, { $\beta$ , 0, 2  $\pi$ }, PlotStyle -> Opacity[0.2], MeshStyle -> None],
ParametricPlot3D[SterProj@ZW[ $\pi/4$ ,  $\theta$ ,  $p/q \theta$ ], { $\theta$ , 0,  $q 2 \pi$ }],
Table[ParametricPlot3D[SterProj@ $\sigma$ @ZW[ $\gamma$ ,  $\beta - \pi/(q^2)$ , inside], { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Blue, PlotPoints -> 50], {n, 0, 2}],
Table[ParametricPlot3D[SterProj@ZW[ $\gamma$ ,  $\beta - \pi/(p^2)$ , outside], { $\gamma$ , 0,  $\pi/4$ }, { $\beta$ , 0, 2  $\pi$ },
  MeshStyle -> None, PlotStyle -> Orange, PlotPoints -> 50], {n, 0, 3}]] // Flatten]

Show[Table[ParametricPlot3D[SterProj@ $\sigma$ @ZW[ $\gamma$ ,  $\beta - \pi/(q^2)$ , inside], { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Blue, PlotPoints -> 50], {n, 0, 2}]]

Show[Table[ParametricPlot3D[SterProj@ $\sigma$ @ZW[ $\gamma$ ,  $\beta - \pi/(q^2)$ , inside], { $\gamma$ , 0,  $\pi/4$ },
  { $\beta$ , 0, 2  $\pi$ }, MeshStyle -> None, PlotStyle -> Blue, PlotPoints -> 50], {n, 0, 2}]]
```



```
RotationTransform[ $\theta$ , { $\theta$ ,  $\theta$ , 1}]
```

```
Manipulate[ParametricPlot3D[RotationTransform[a, { $\theta$ ,  $\theta$ , 1}]@  
SterProj@ZW[ $\pi/4$ , p/q( $\theta$ ),  $\theta$ ], { $\theta$ ,  $\theta$ , q 2  $\pi$ }], {a,  $\theta$ , 2  $\pi$ }]
```