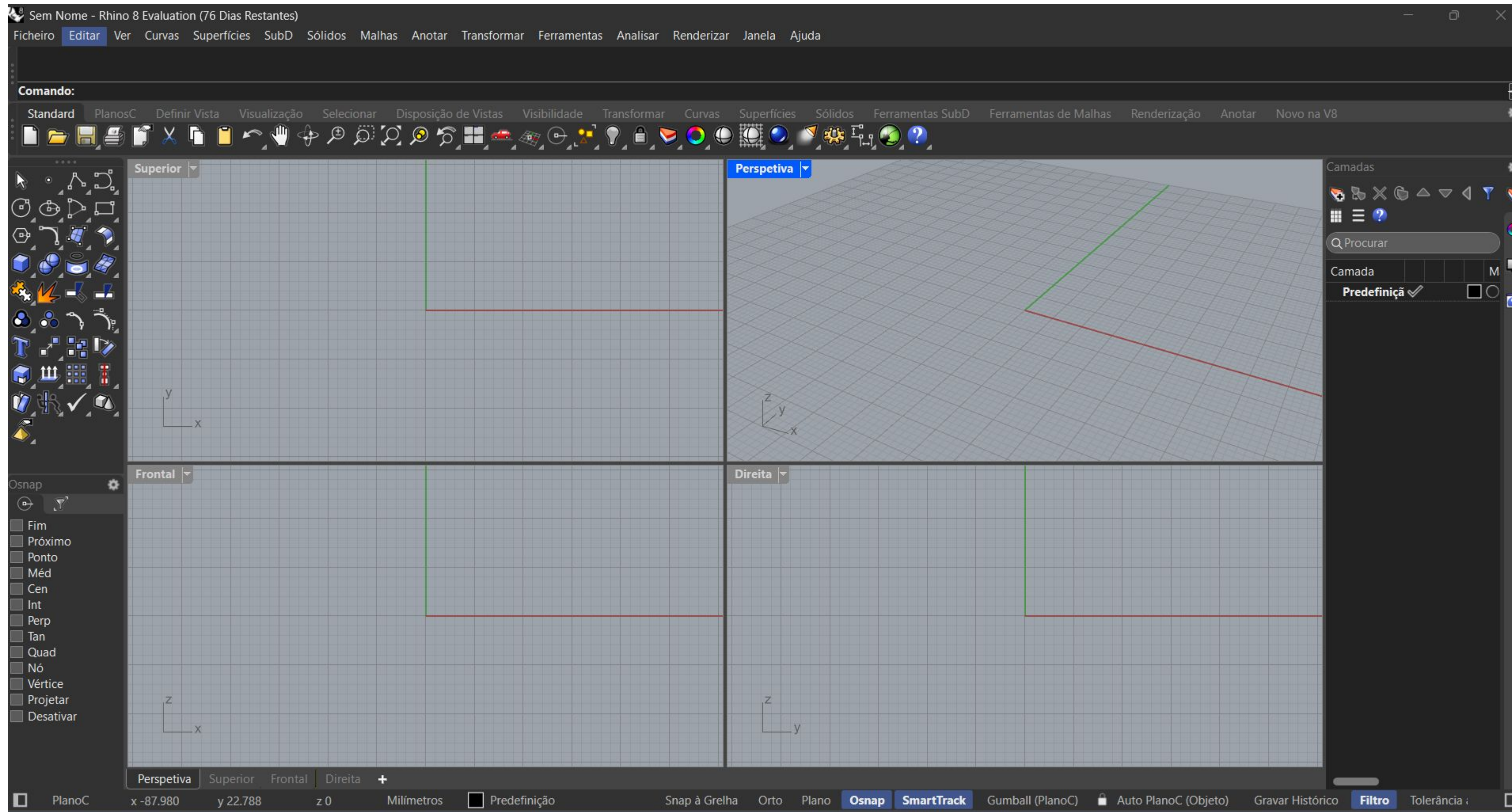


Modelação Geométrica e Generativa

20241286

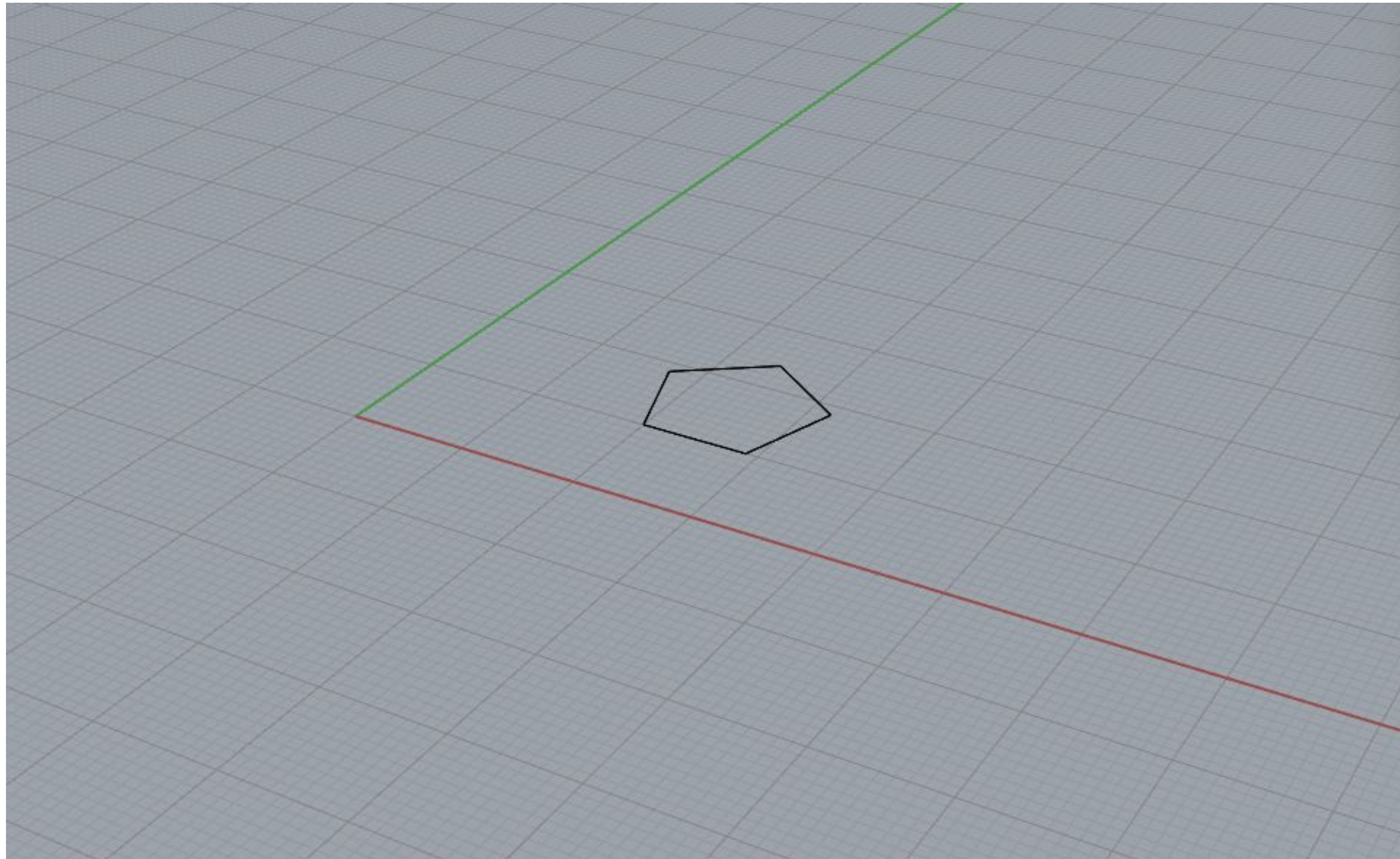
DIANA KHALYKNAZAROVA





Introdução do programa Rhino

Polígono



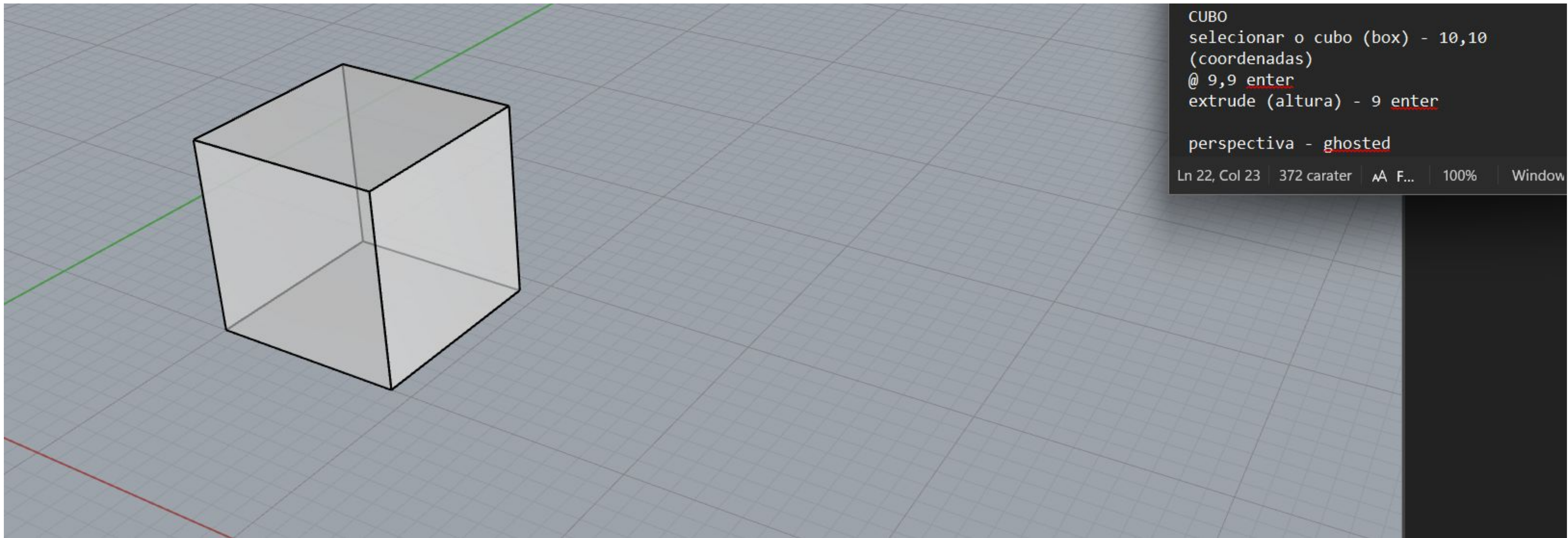
```
Ficheiro  Editar  Ver  Aa  [Color Picker]  [User Icon]  [Settings Icon]

Ficheiro - objetos pequenos centímetros -
abrir (cada quadradinho equivale a 1cm)

• POLYLINE - linhas seguidas

PENTAGONO
1. poly - enter
coordenadas:
20,10
@9<0 enter
@9<72 enter
@9<144 enter
@9<216 enter
c (close) enter
```

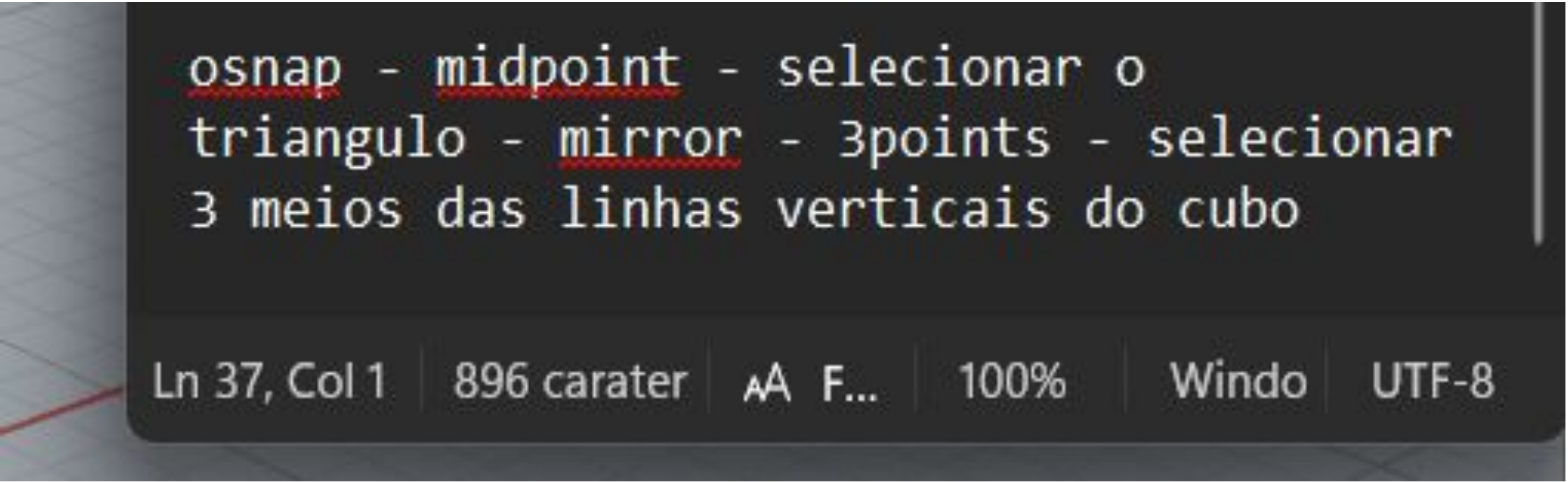
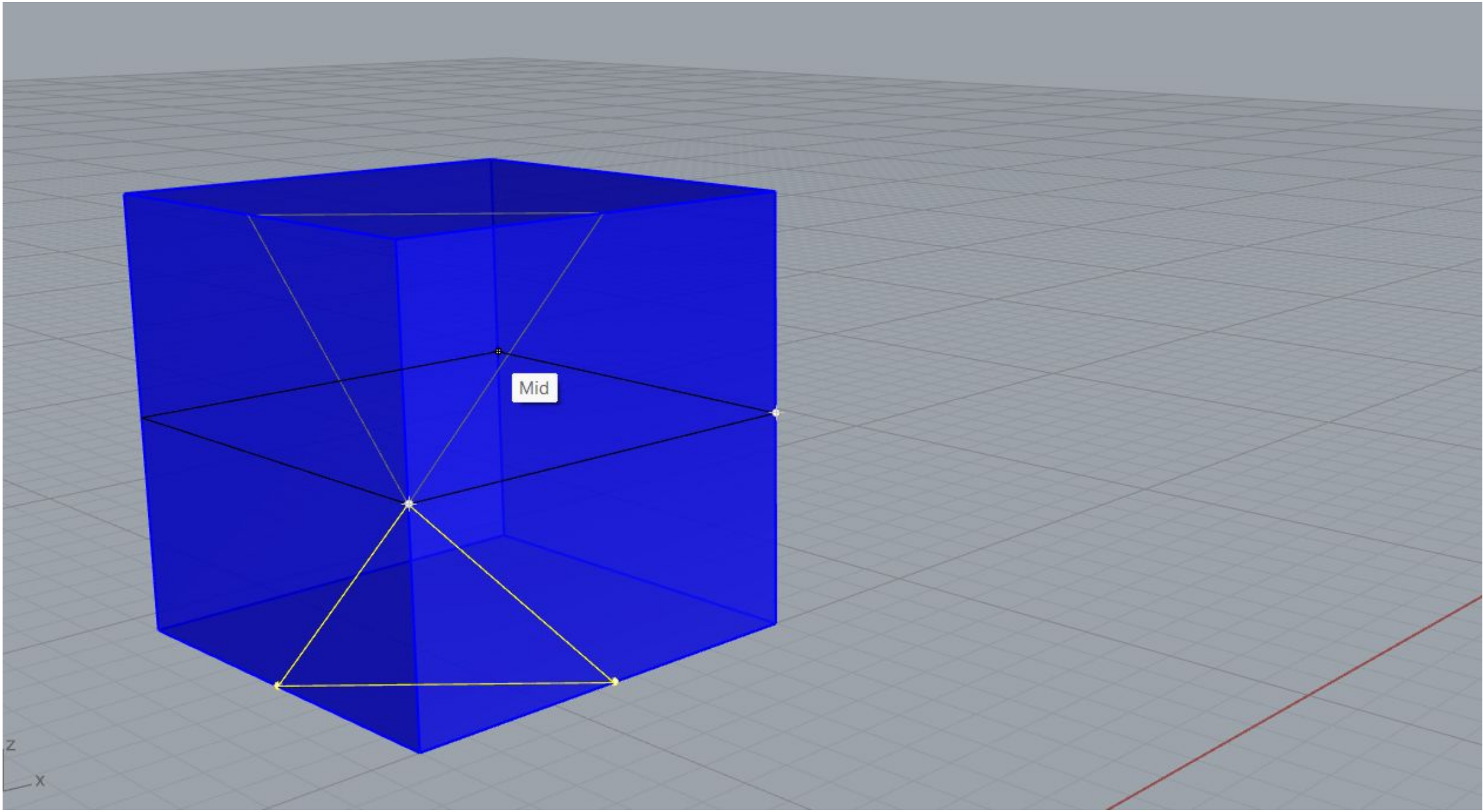
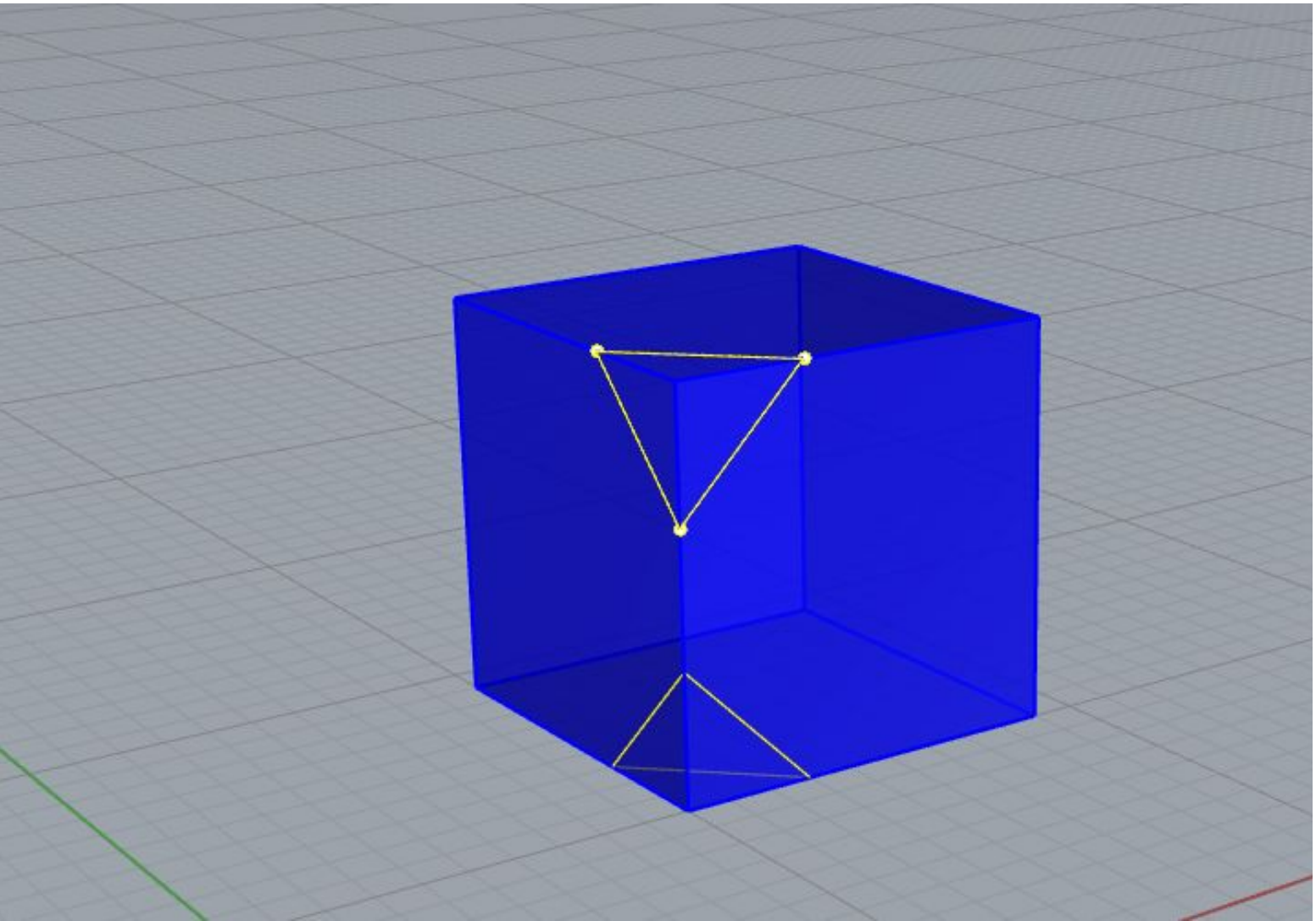
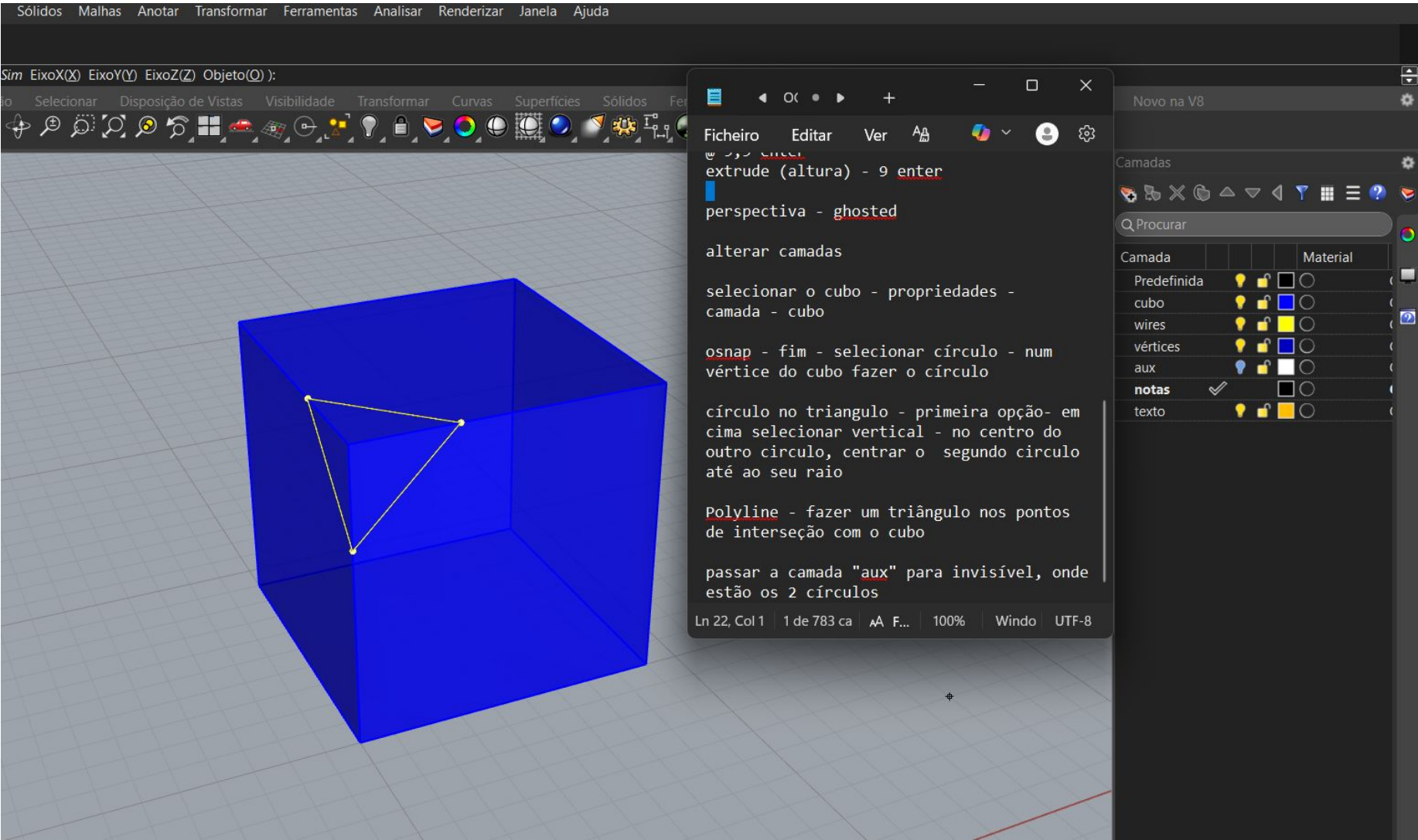
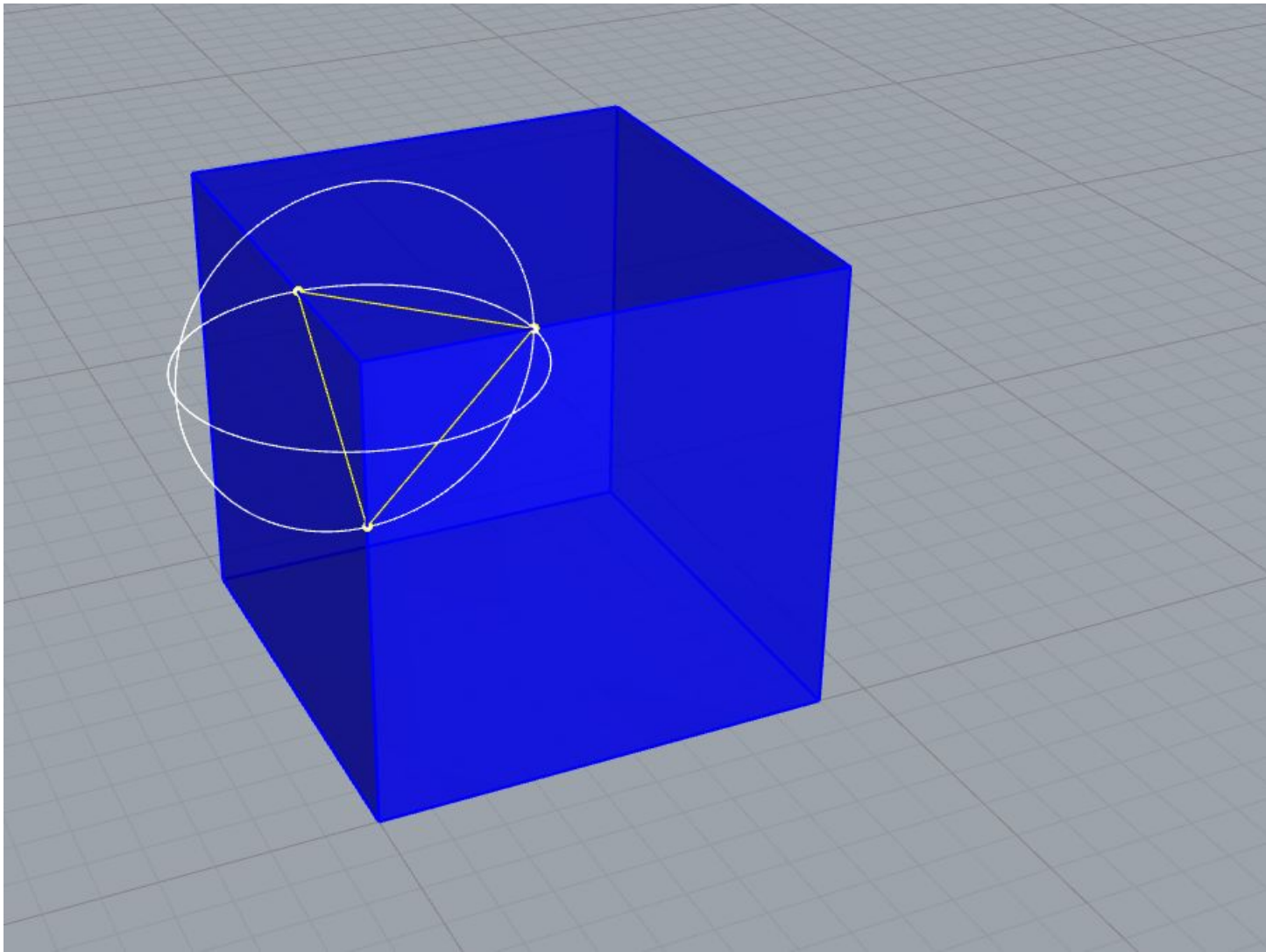
CUBO TRUNCADO

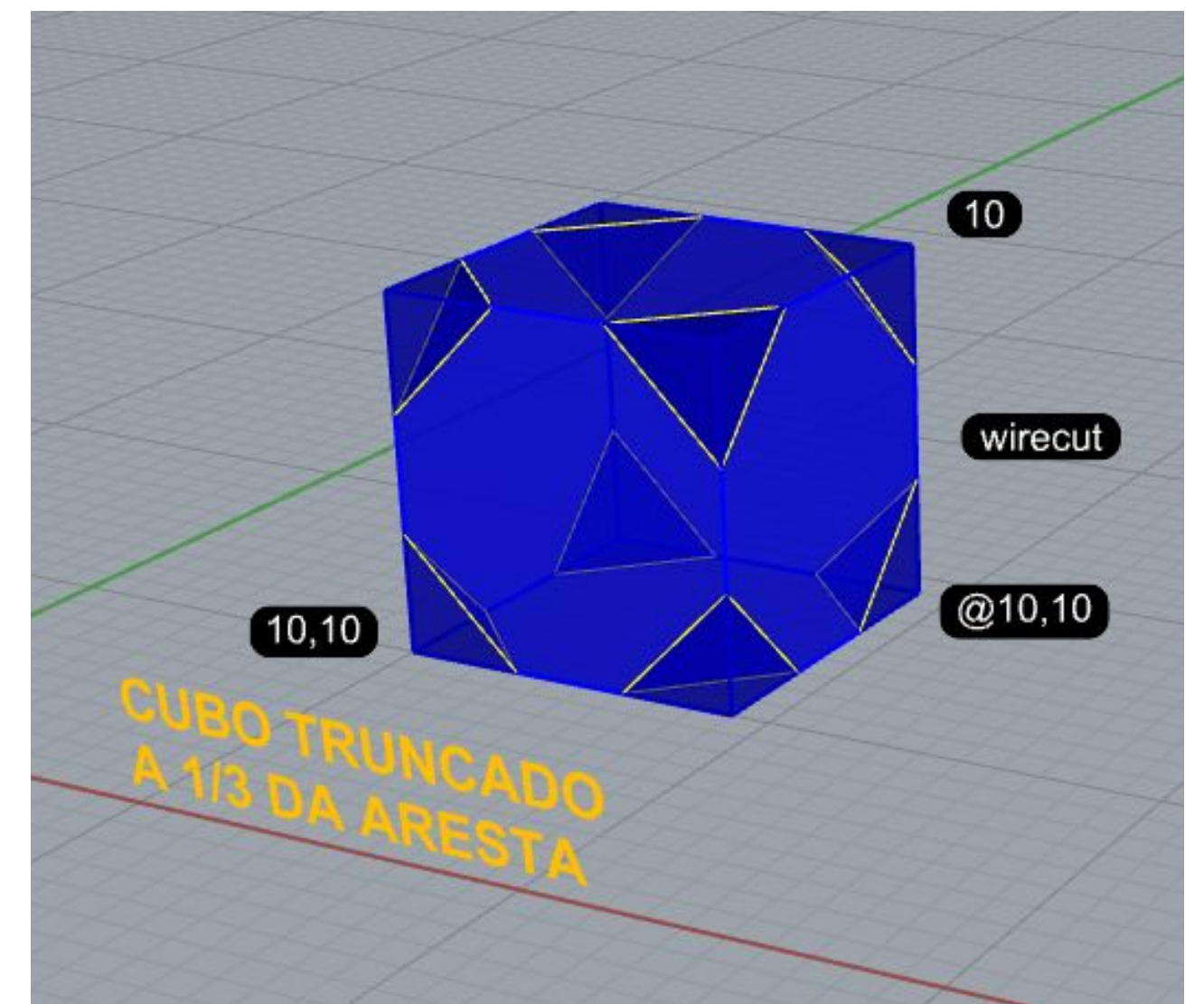
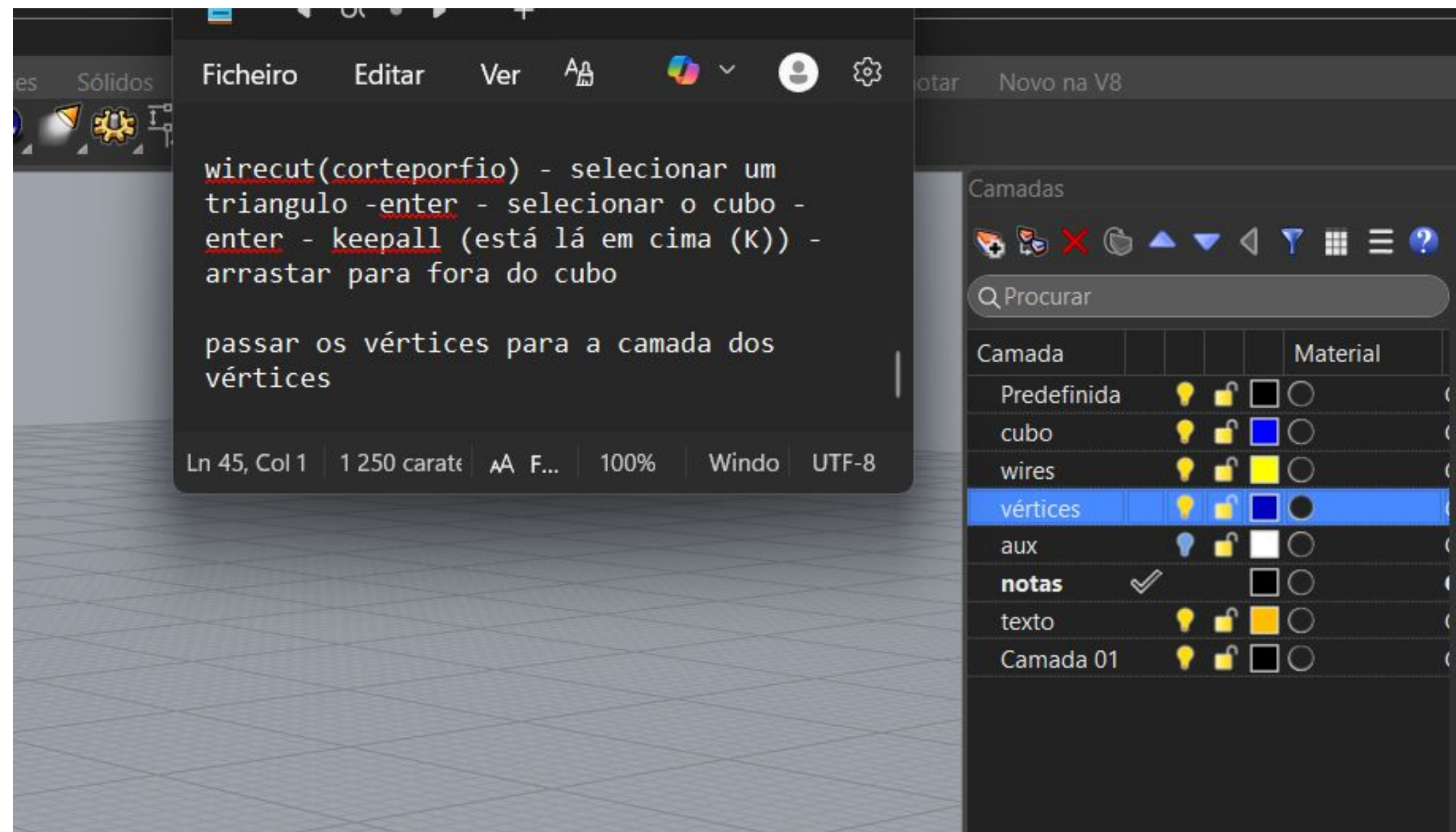
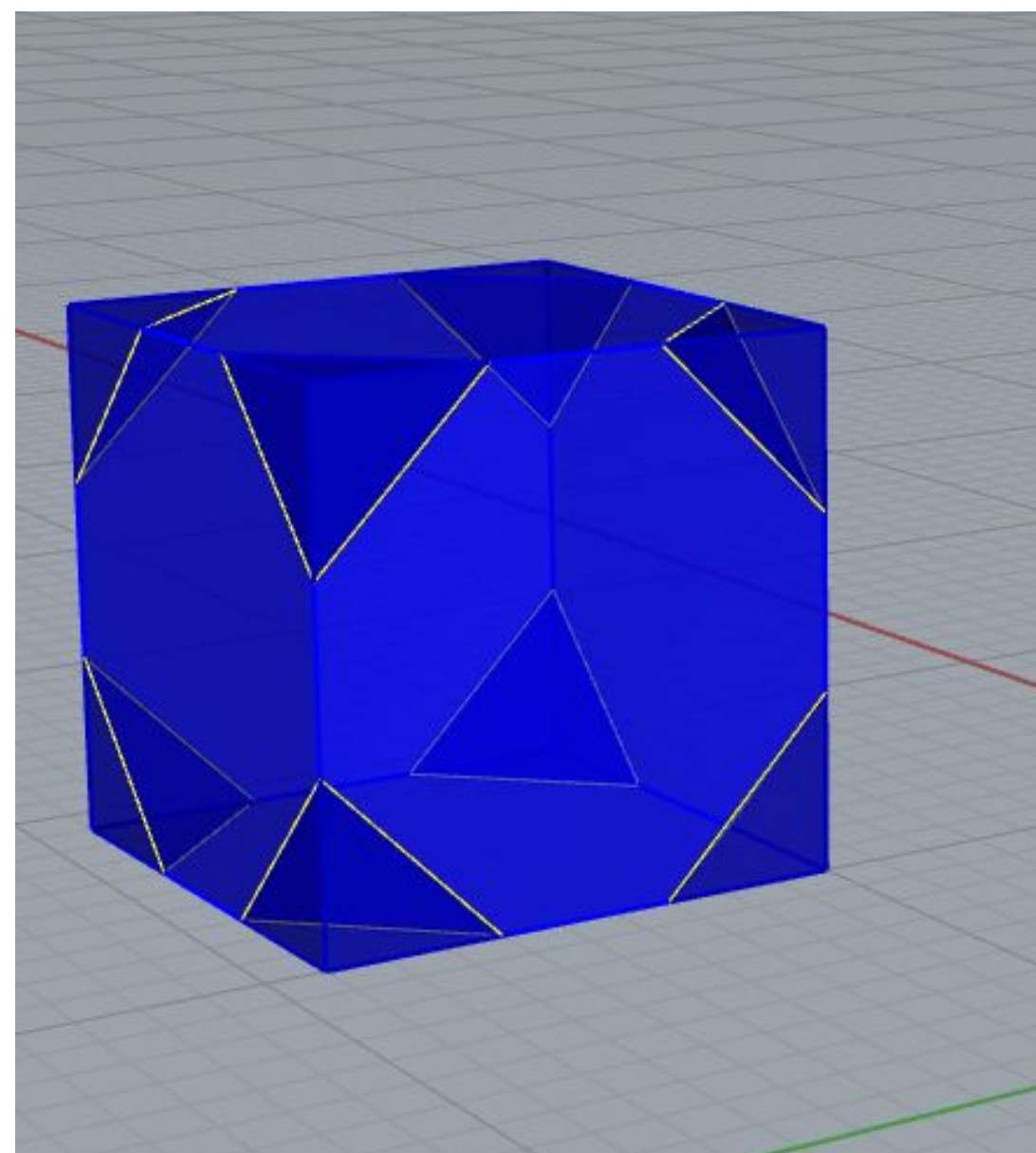
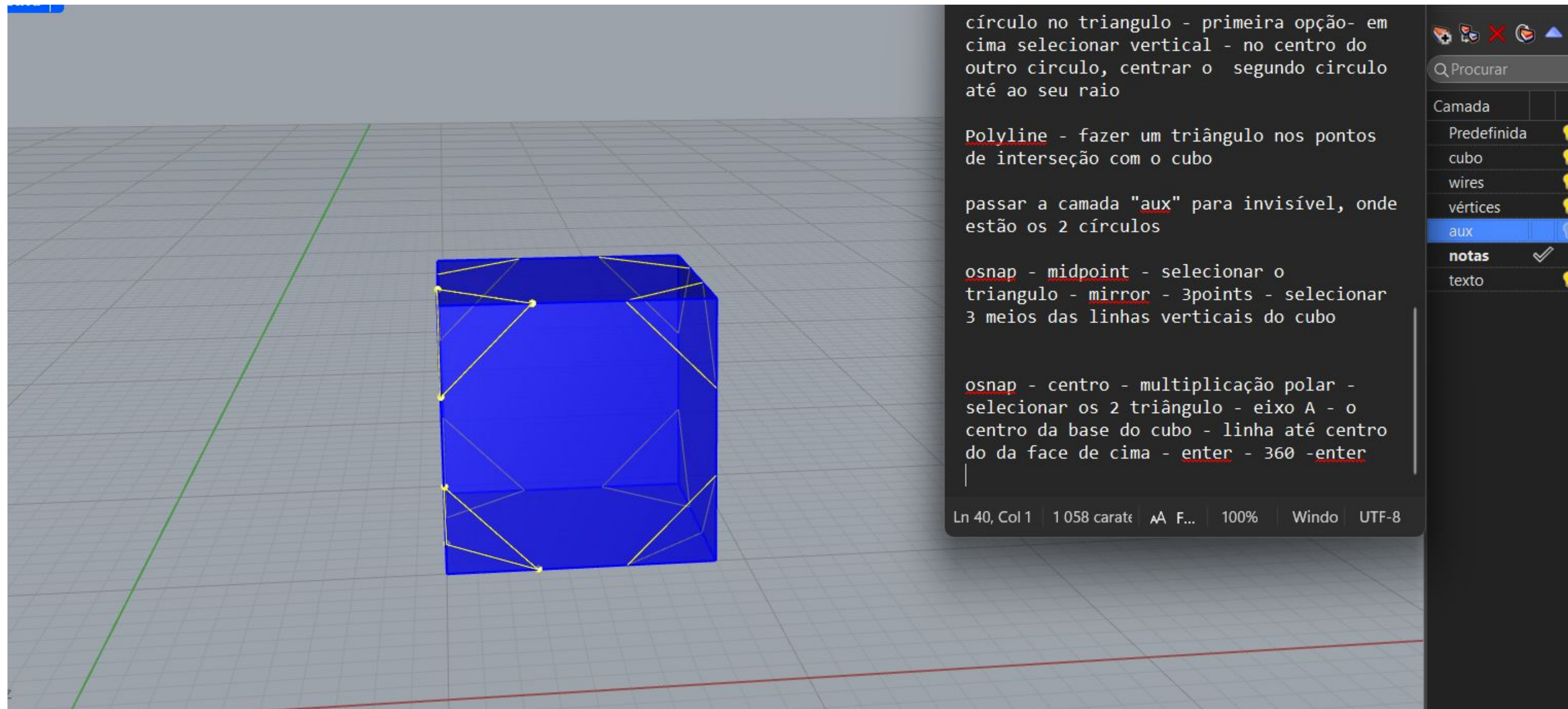


```
CUBO  
seleccionar o cubo (box) - 10,10  
(coordenadas)  
@ 9,9 enter  
extrude (altura) - 9 enter
```

```
perspectiva - ghosted
```

```
Ln 22, Col 23 | 372 carater |  F... | 100% | Window
```







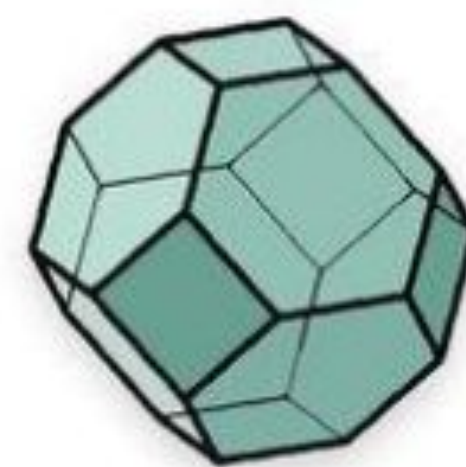
*tetraedro
truncado*



*hexaedro
truncado*



cuboctaedro



*octaedro
truncado*



rombicuboctaedro



*cuboctaedro
truncado*



*cuboctaedro
romo*



*dodecaedro
truncado*



*icosaedro
truncado*



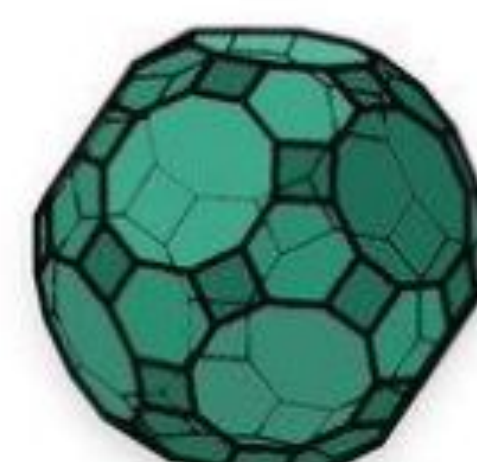
icosidodecaedro



rombicosidodecaedro

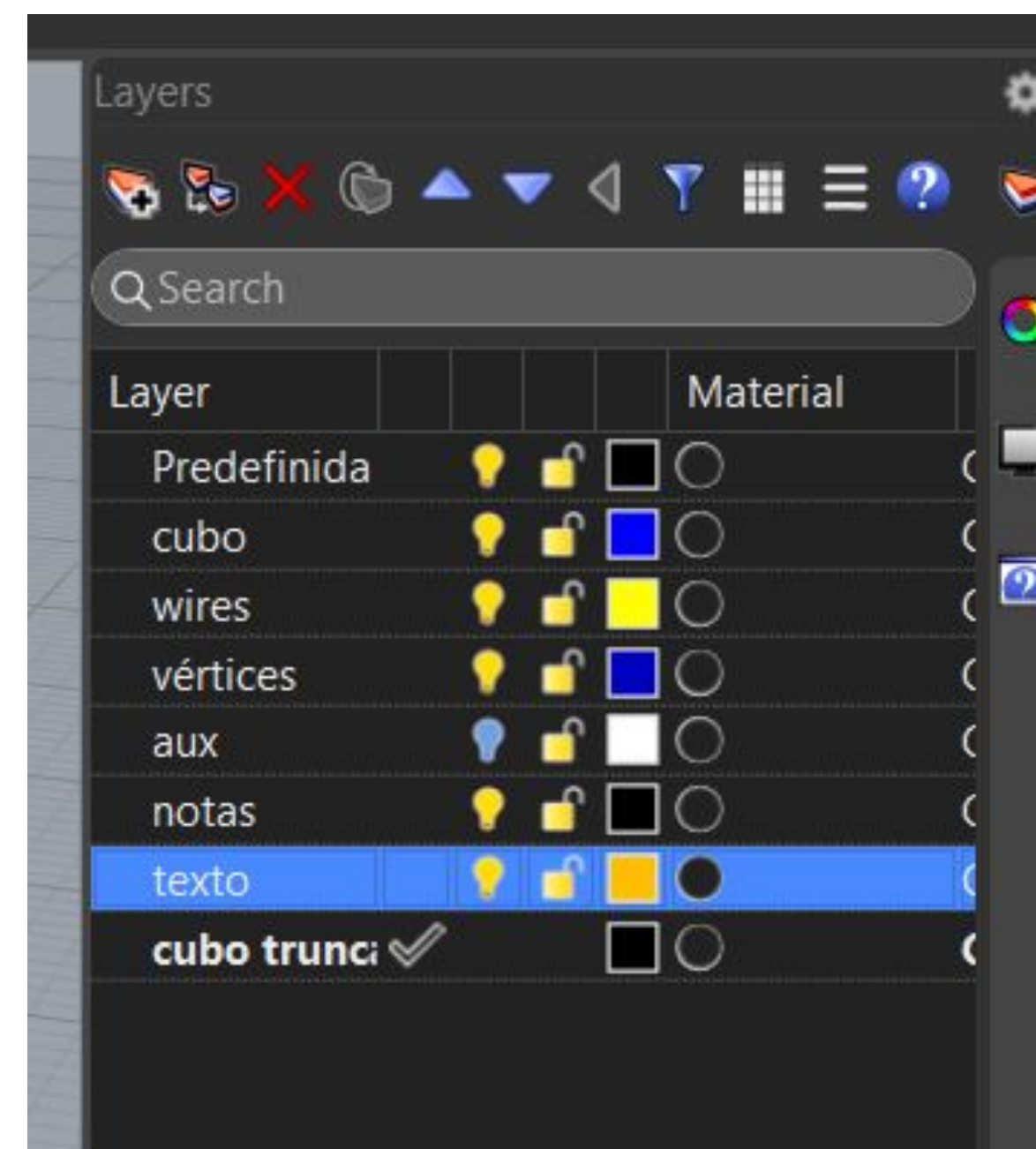
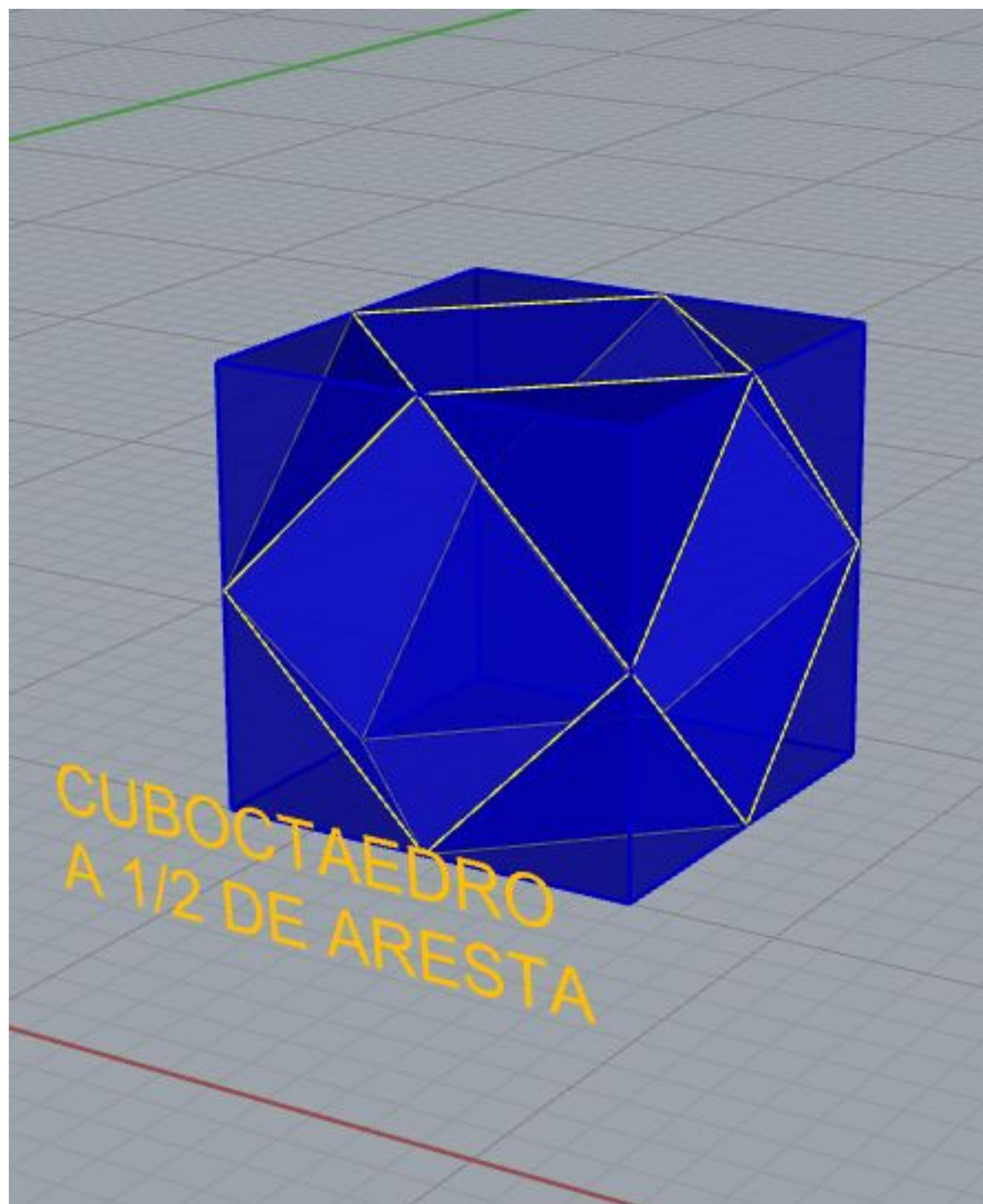


*icosidodecaedro
truncado*



icosidodecaedro romo

CUBOCTAEDRO

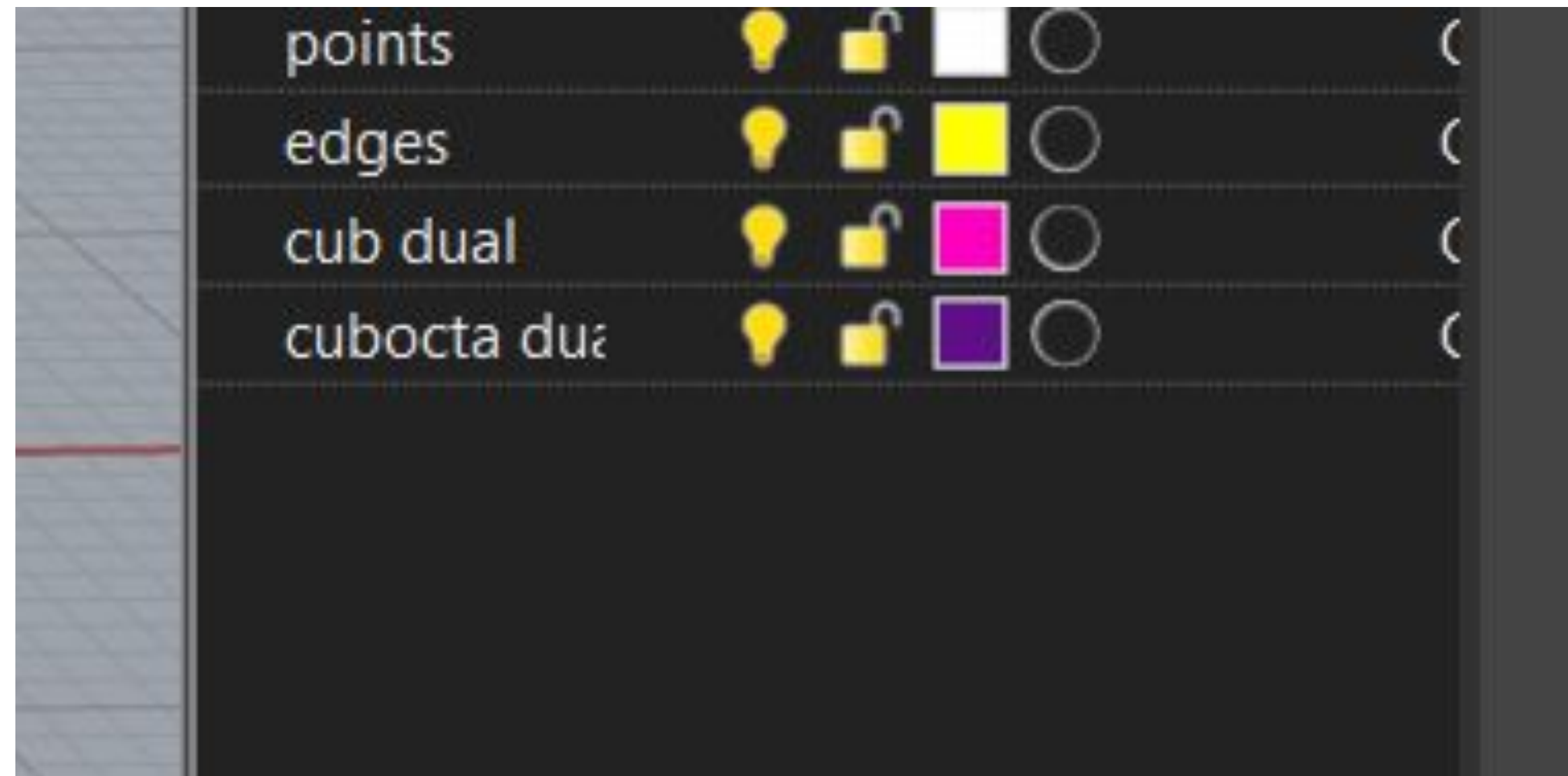


- TPC - fazer cuboctaedro -1/2

CUBOCTAEDRO

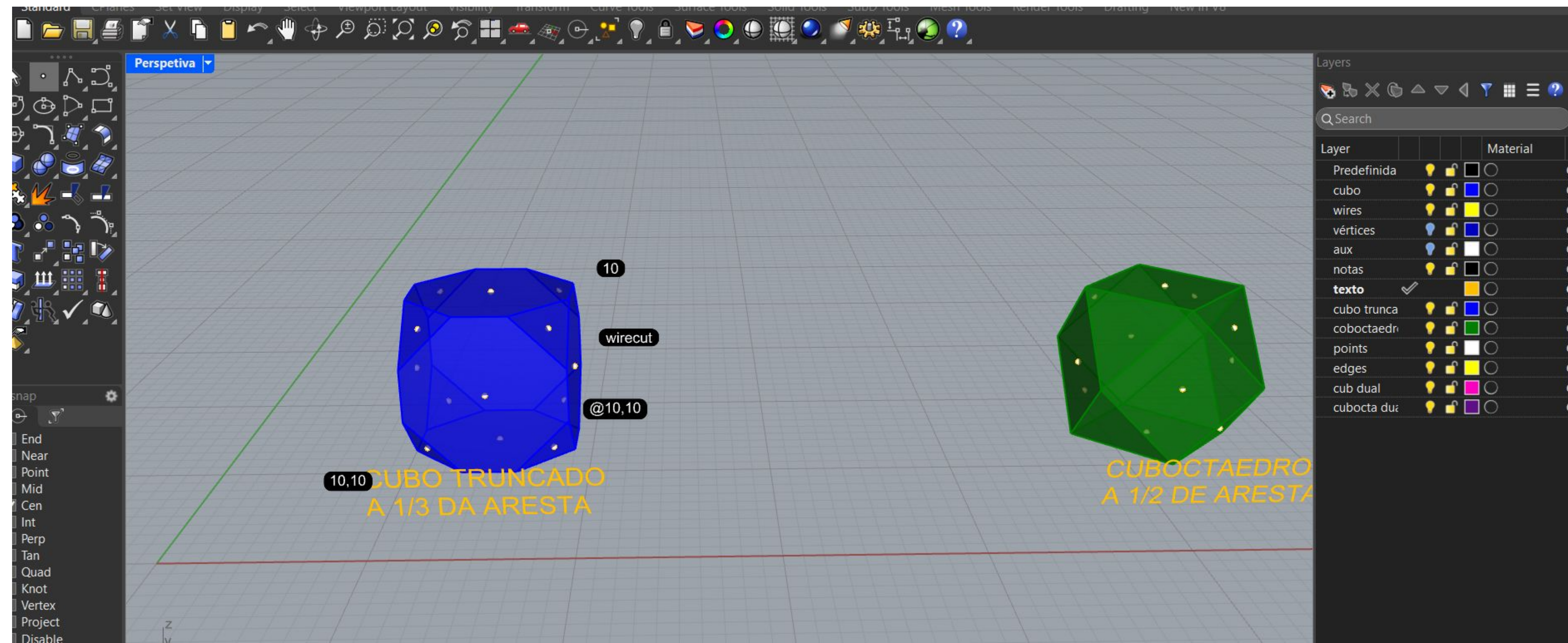
- CUBO @9,9 ENTER 9 altura ENTER
- circunferência num dos vértices até ao centro de uma aresta do cubo
- opção "círculo" (carregar no triagulosinho), 1 opção, "vertical", centro do primeiro círculo até ao raio
- osnap - int , "polyline" e fazer um triângulo
- osnap - midpoint - seleccionar o triângulo - mirror - 3points - seleccionar 3 meios das linhas verticais do cubo
- osnap - center - arraypolar - seleccionar os dois triângulos - eixo A, centro da base do cubo até à fase superior, 4 , 360, enter
- seleccionar um triângulo, wirecut, seleccionar o cubo, enter, keepall, arrastar para fora do cubo, enter
- text - legenda
- dot - anotações

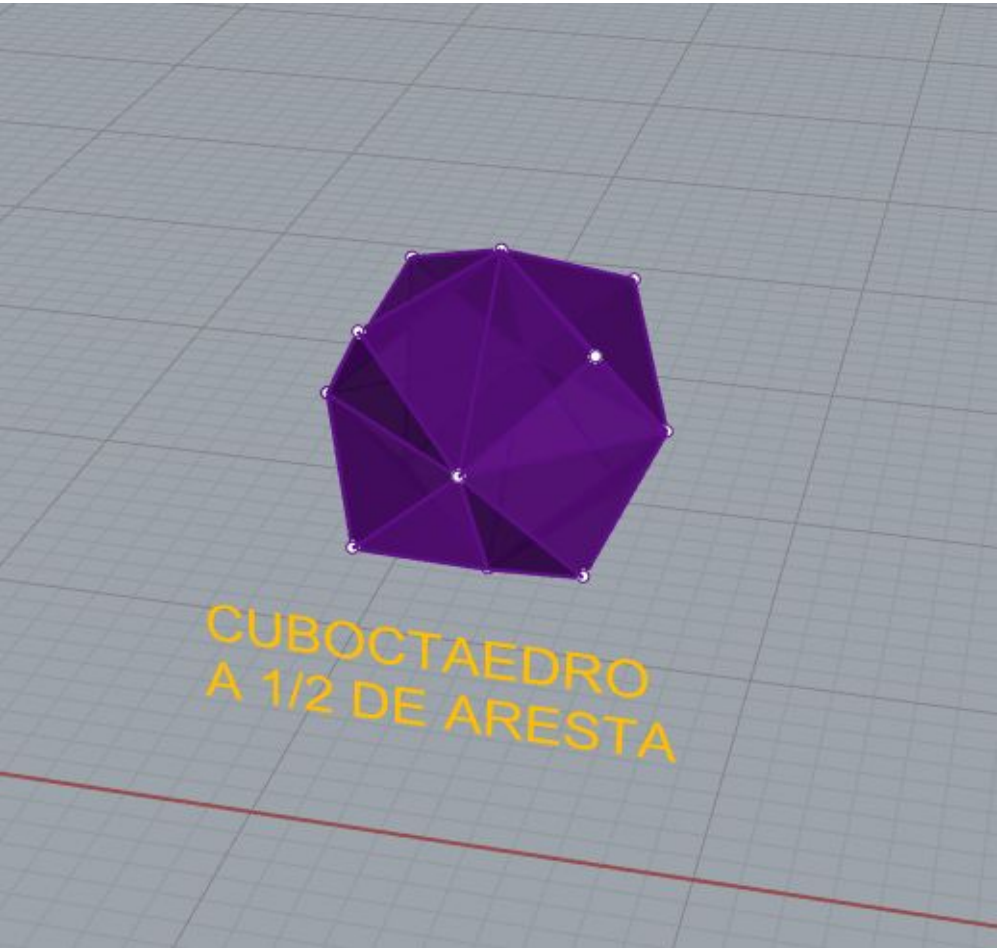
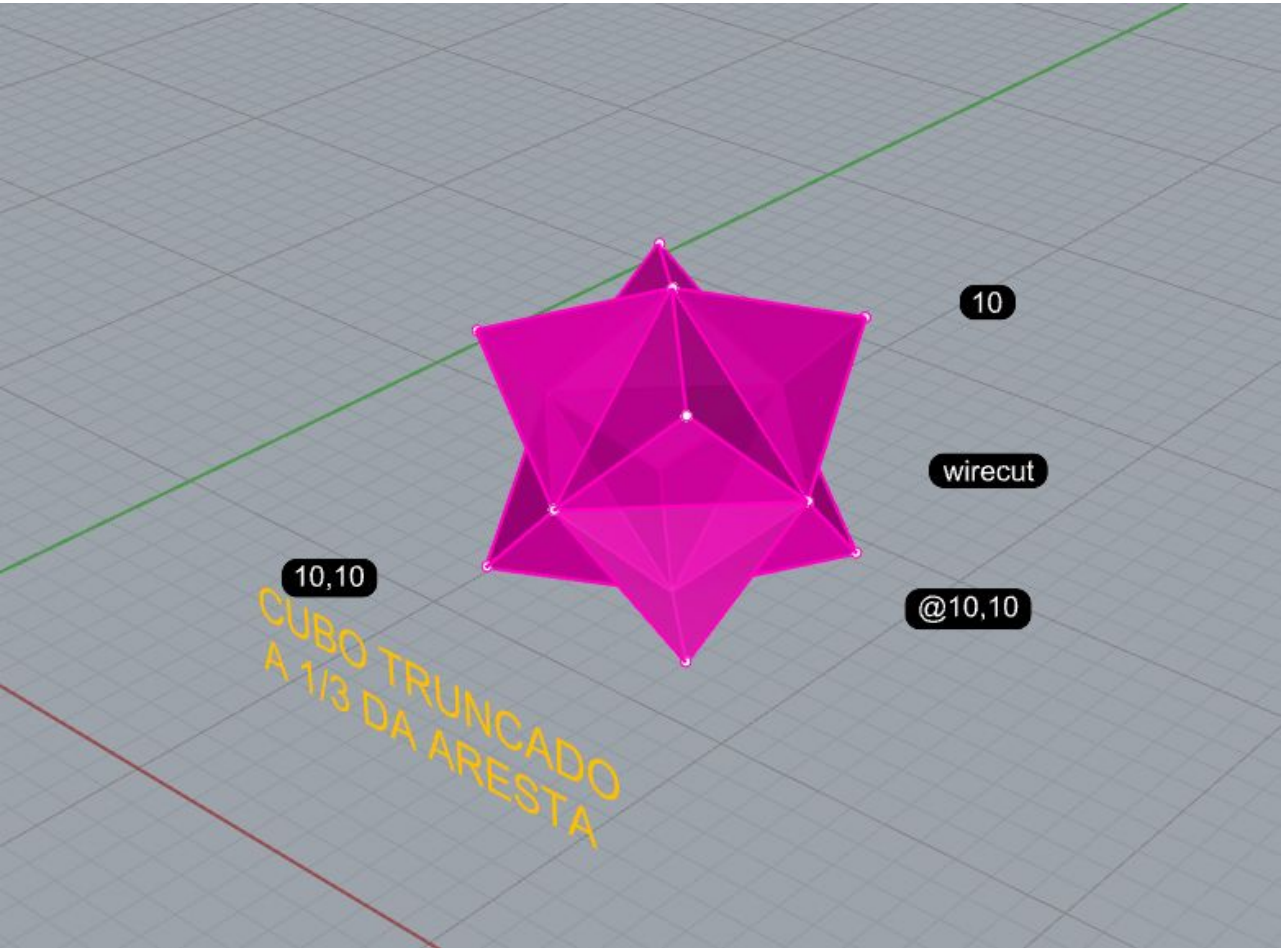
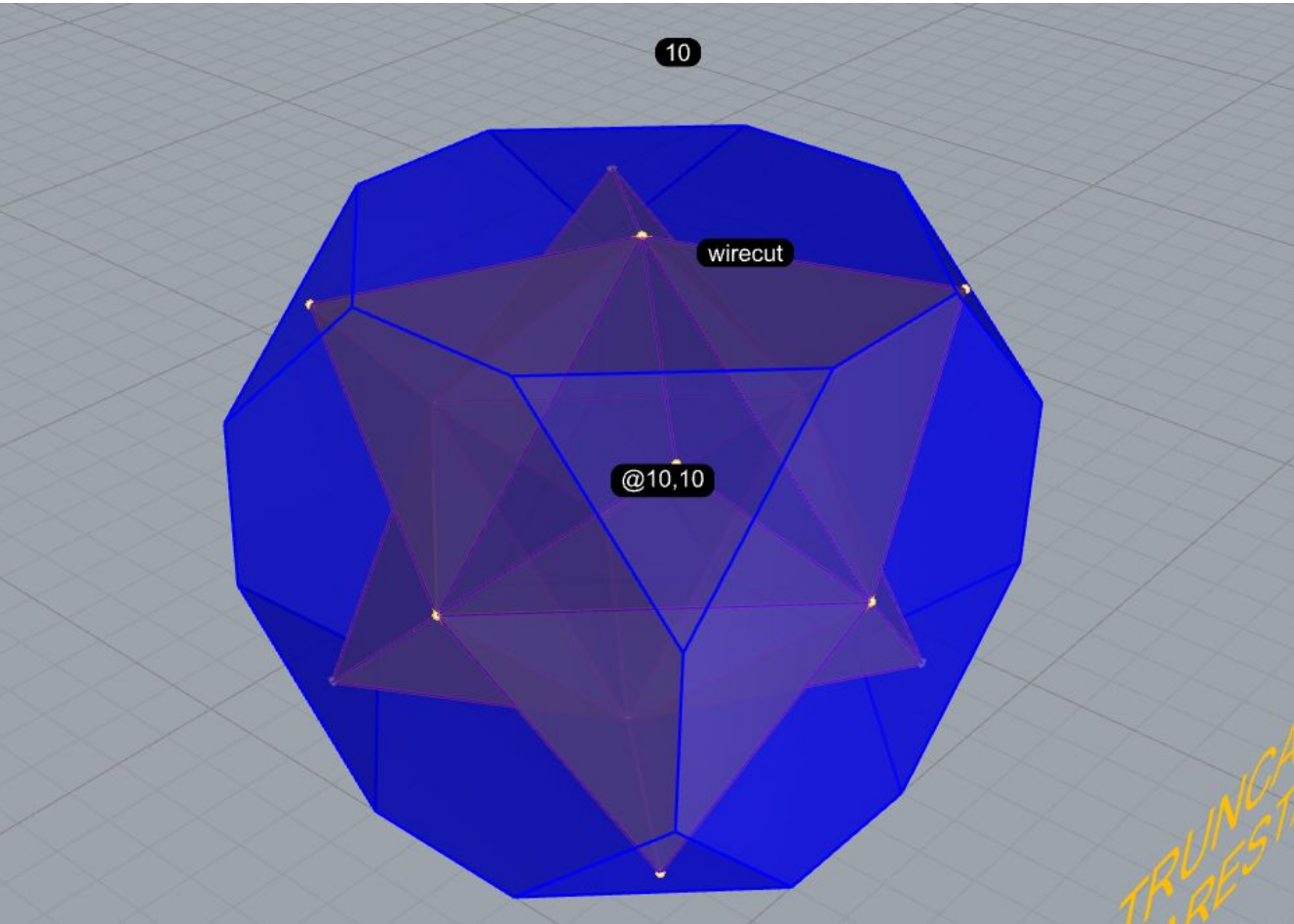
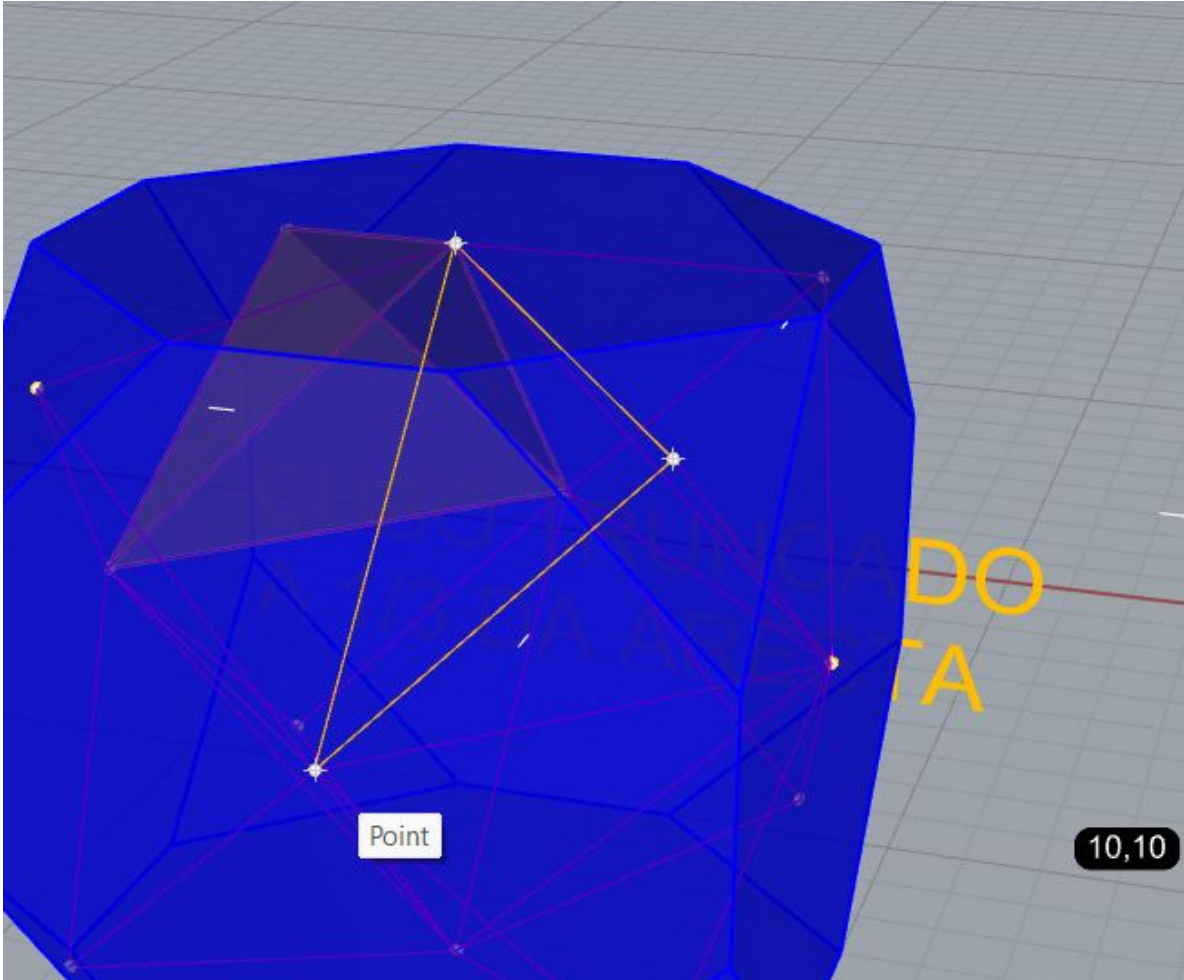
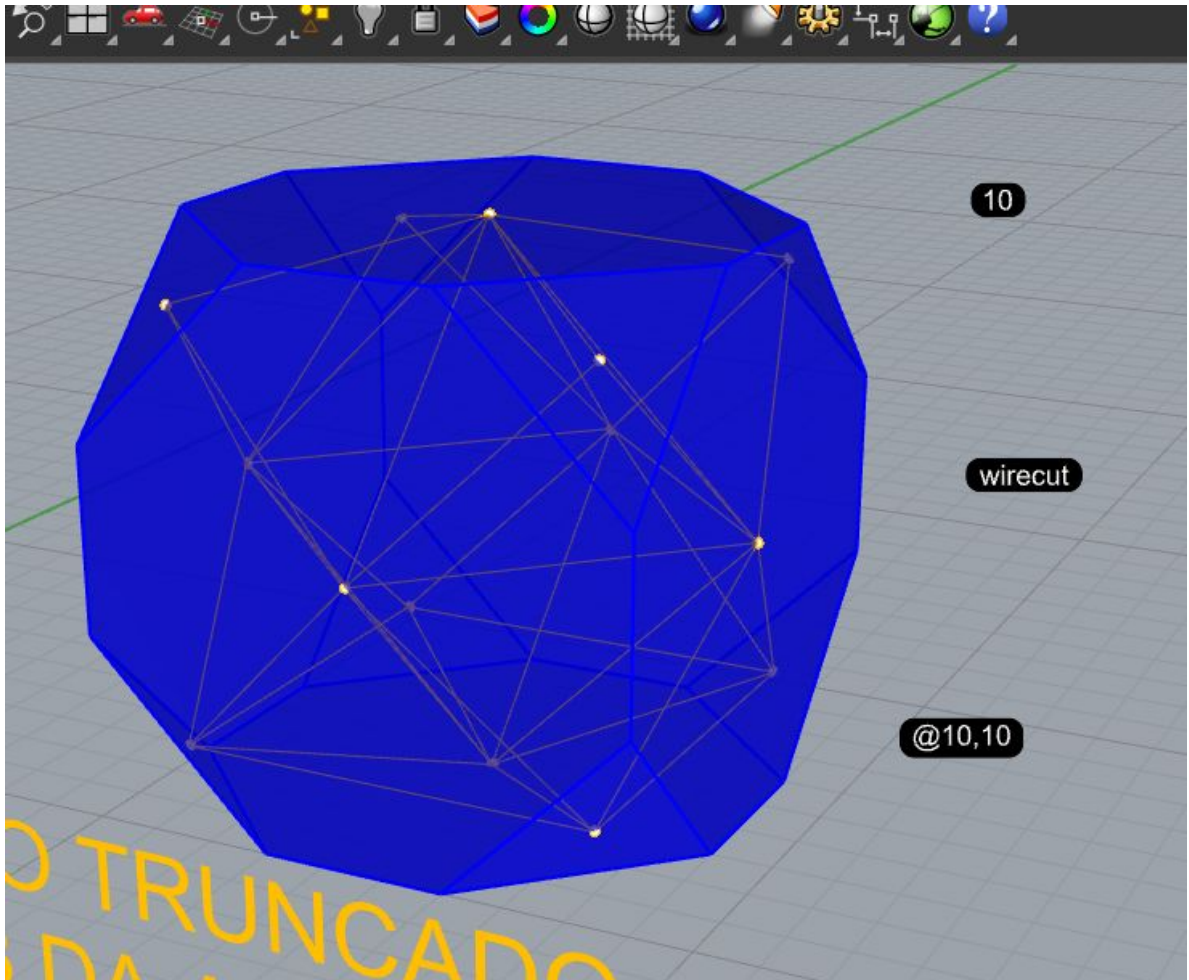
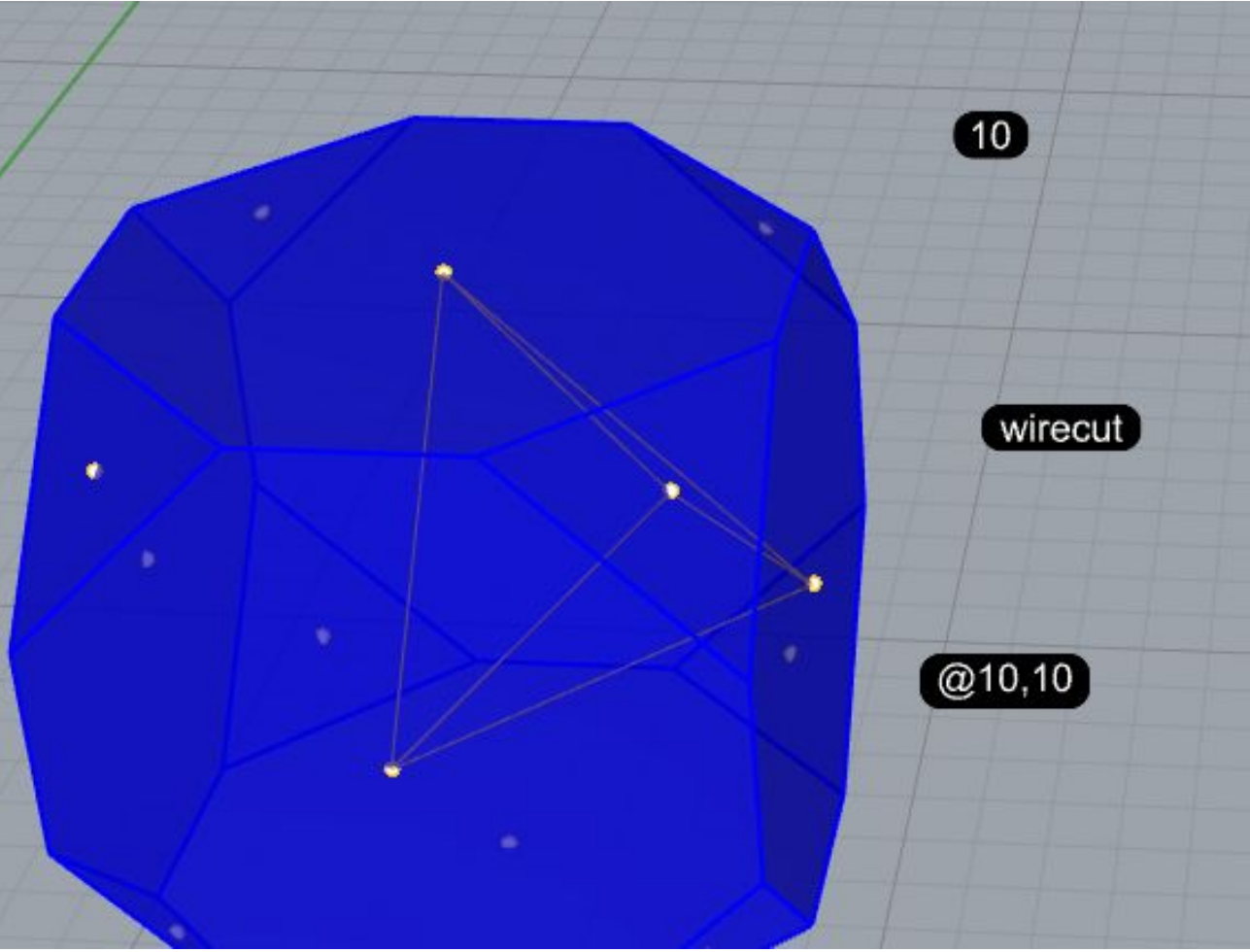
CUBO E CUBOCTAEDRO - DUAL



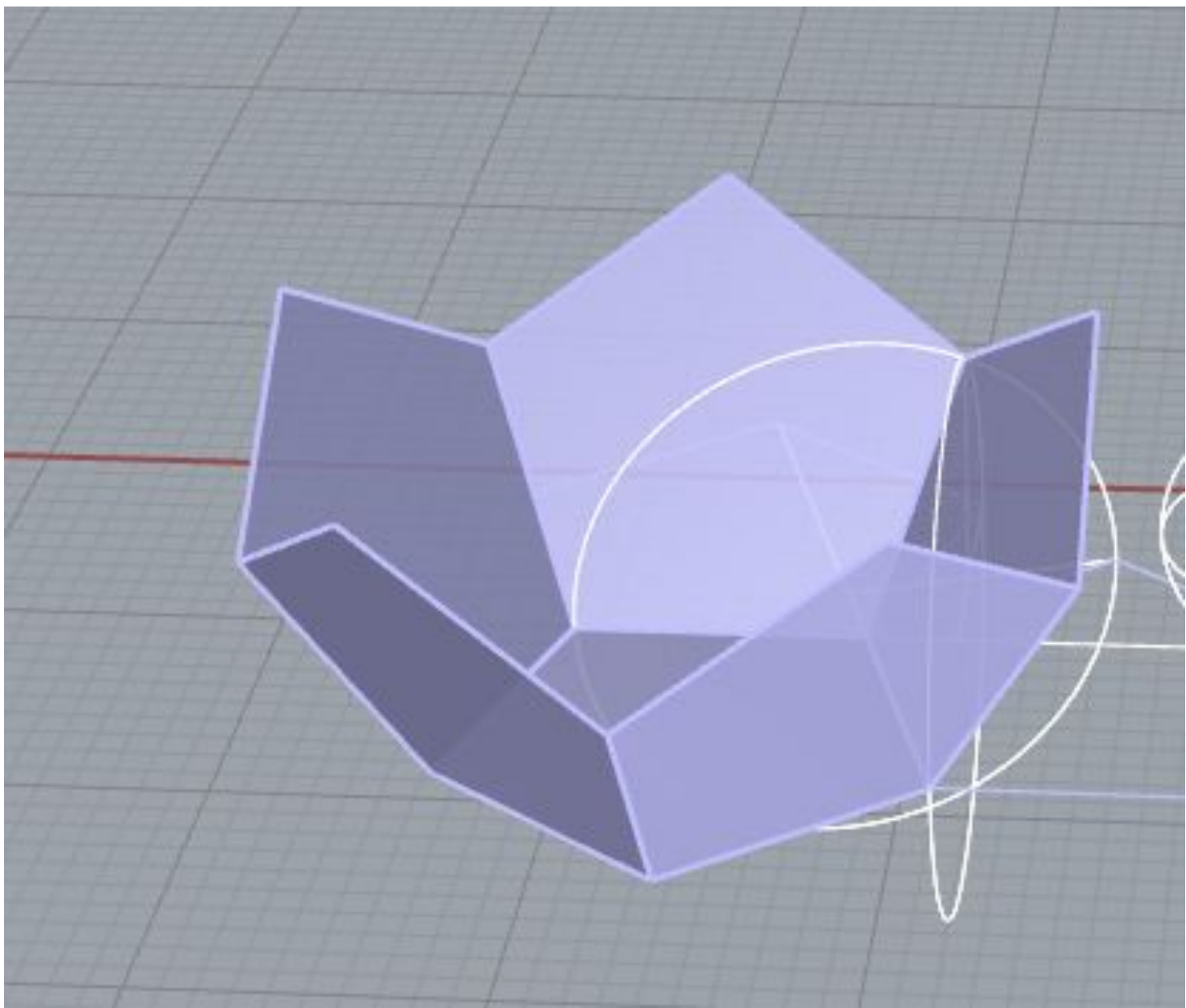
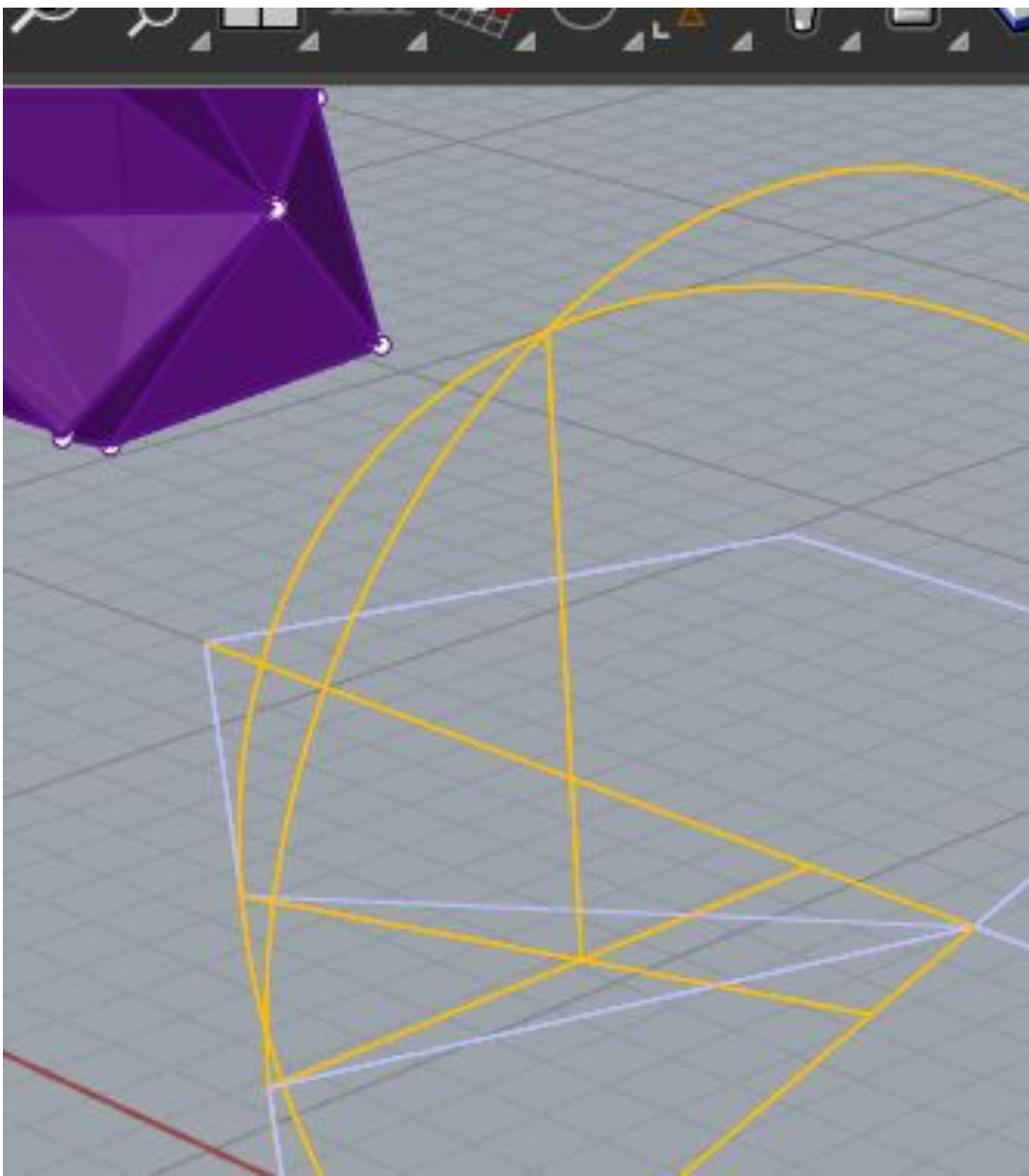
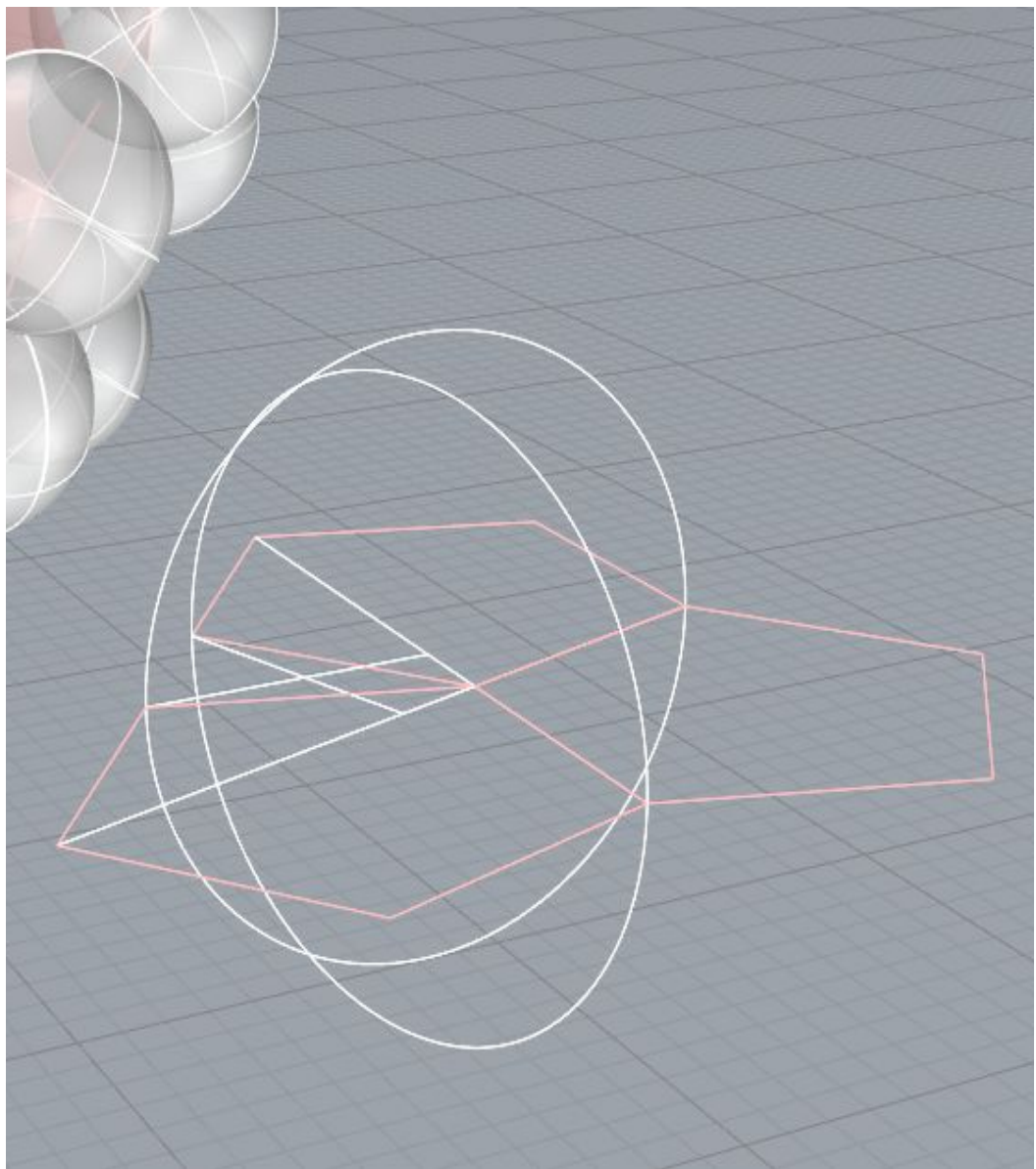
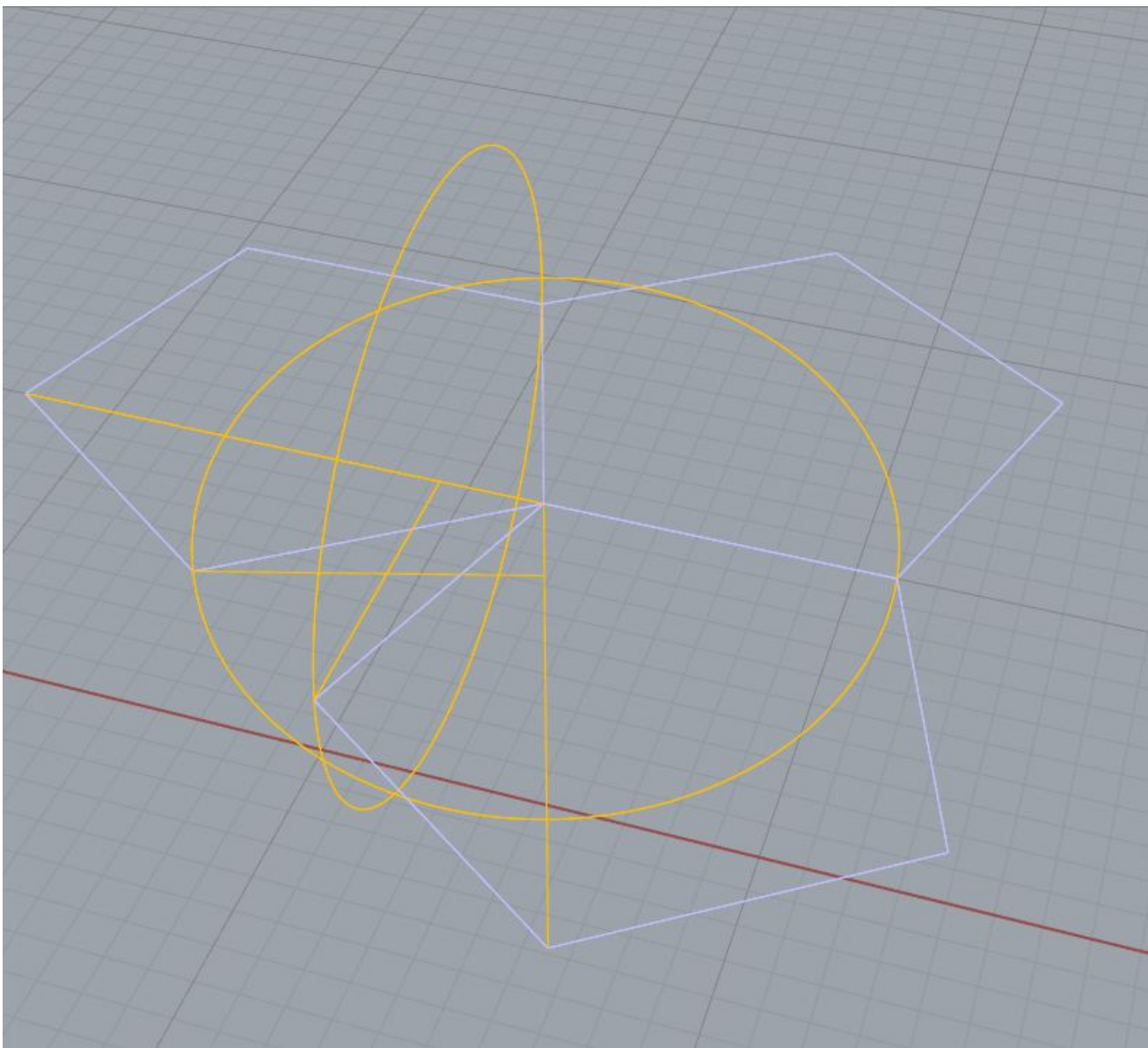
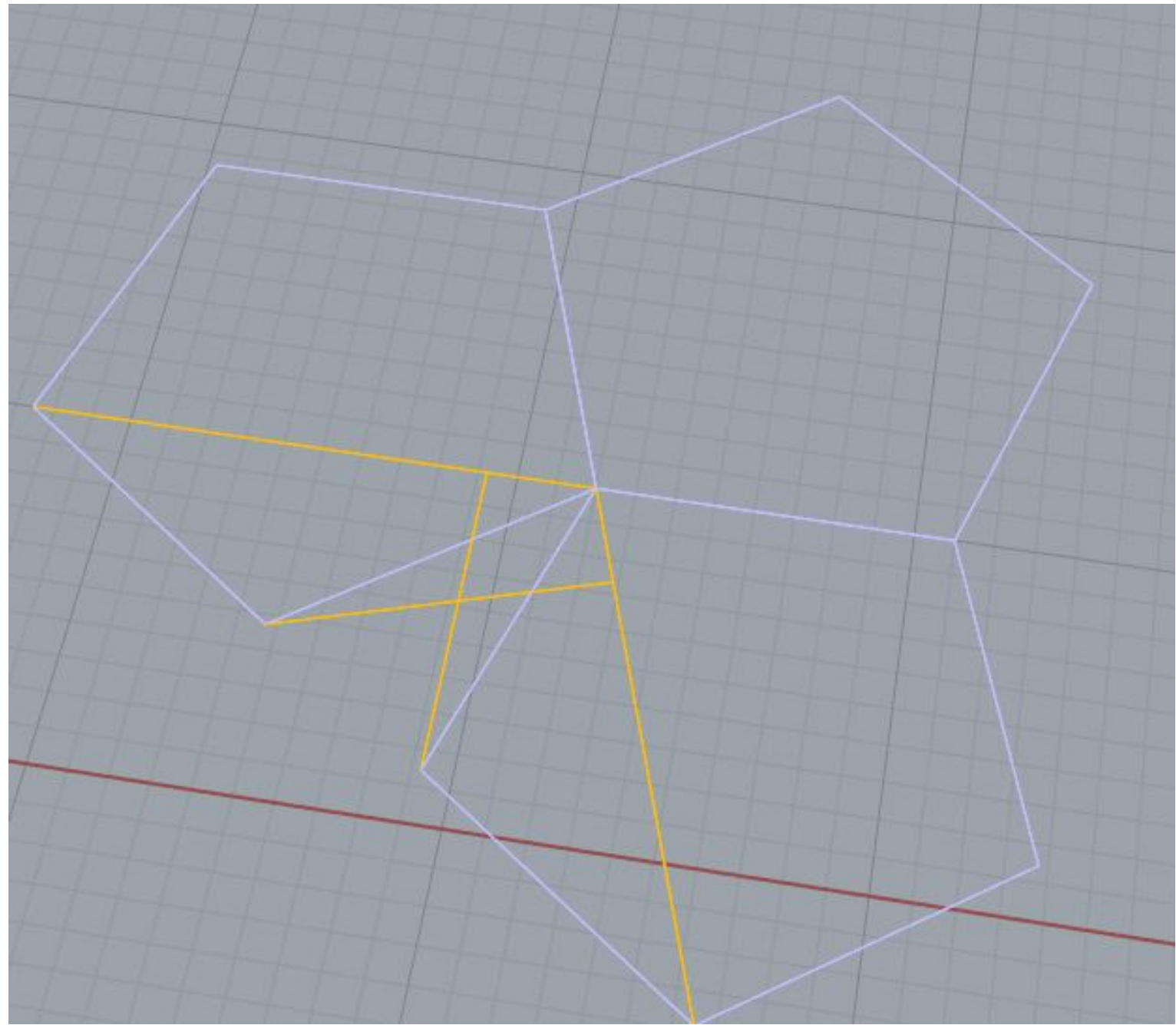
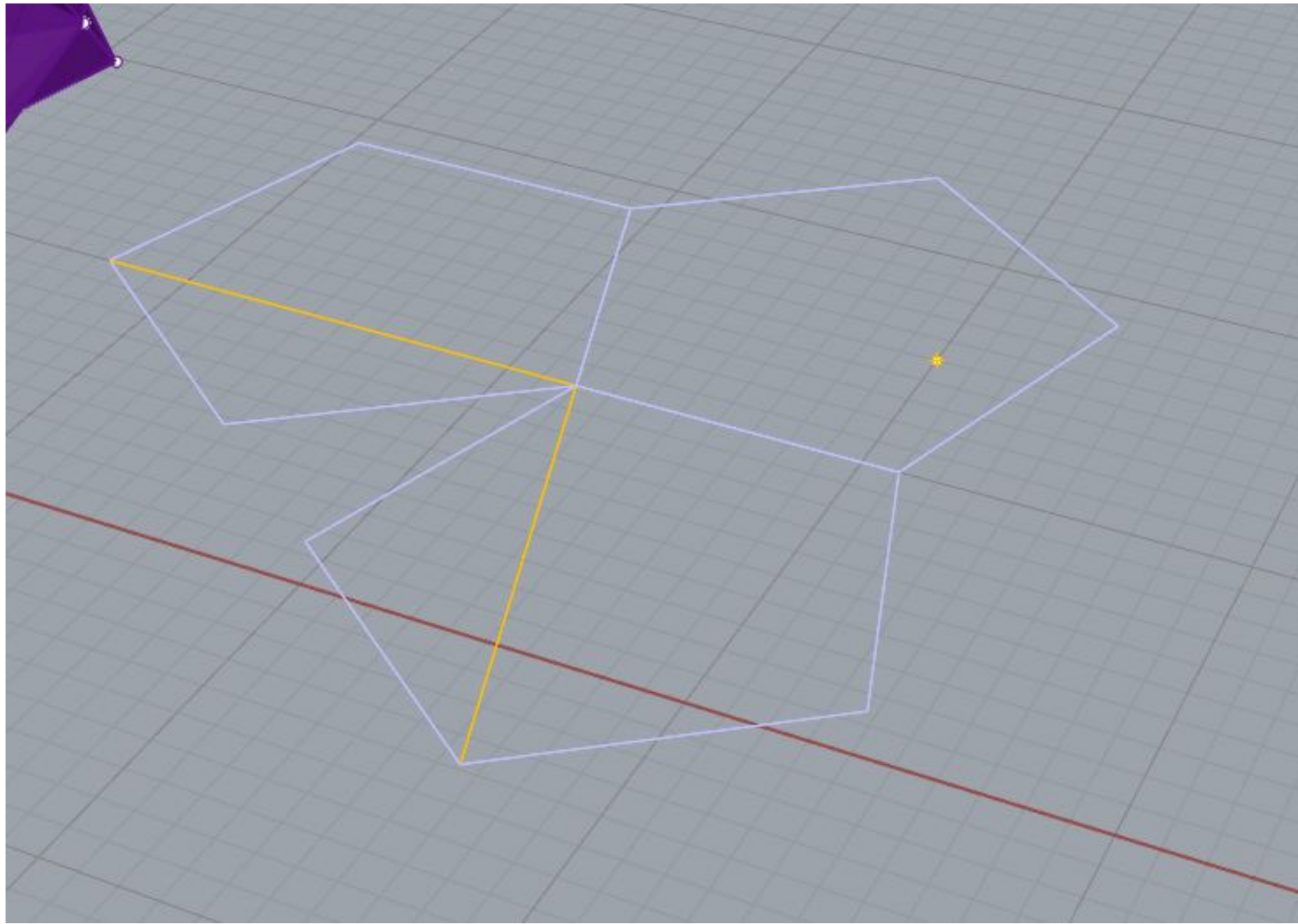
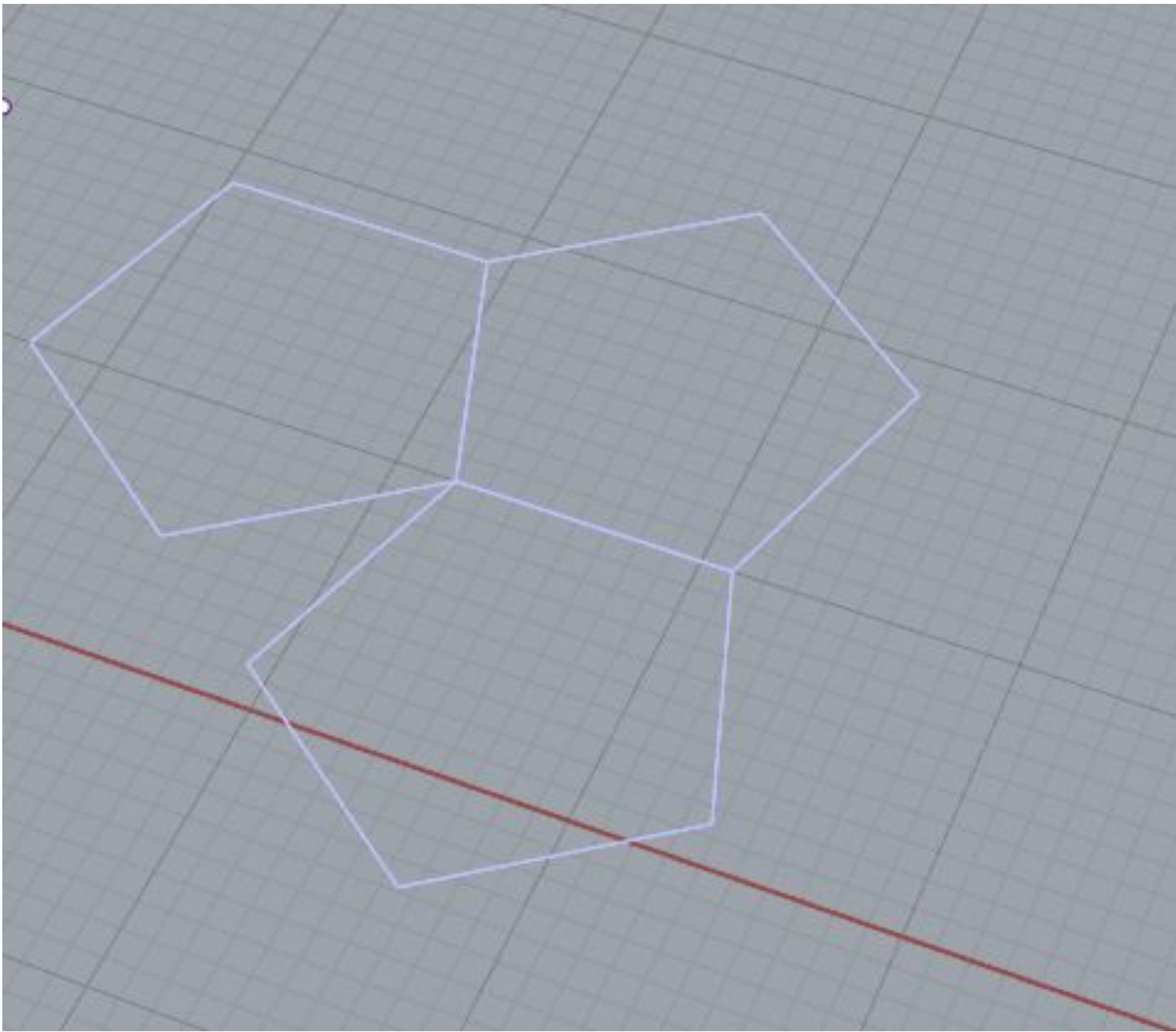
Construção do DUAL

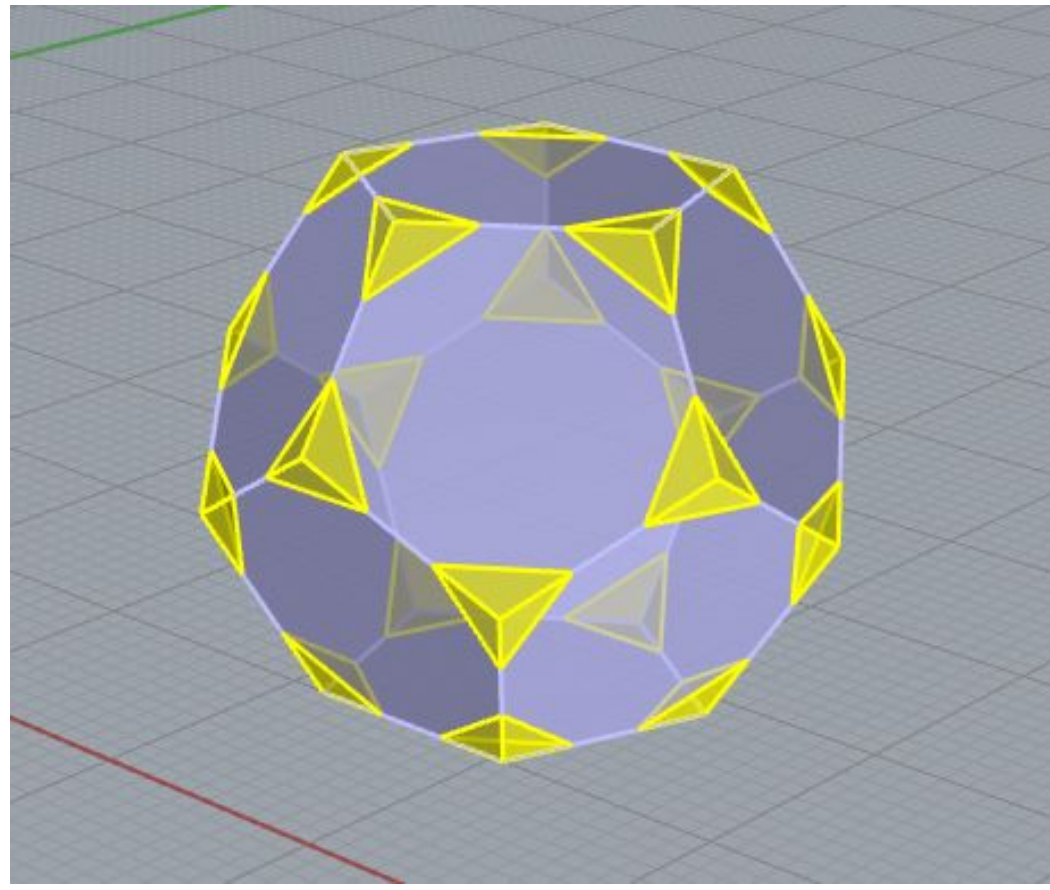
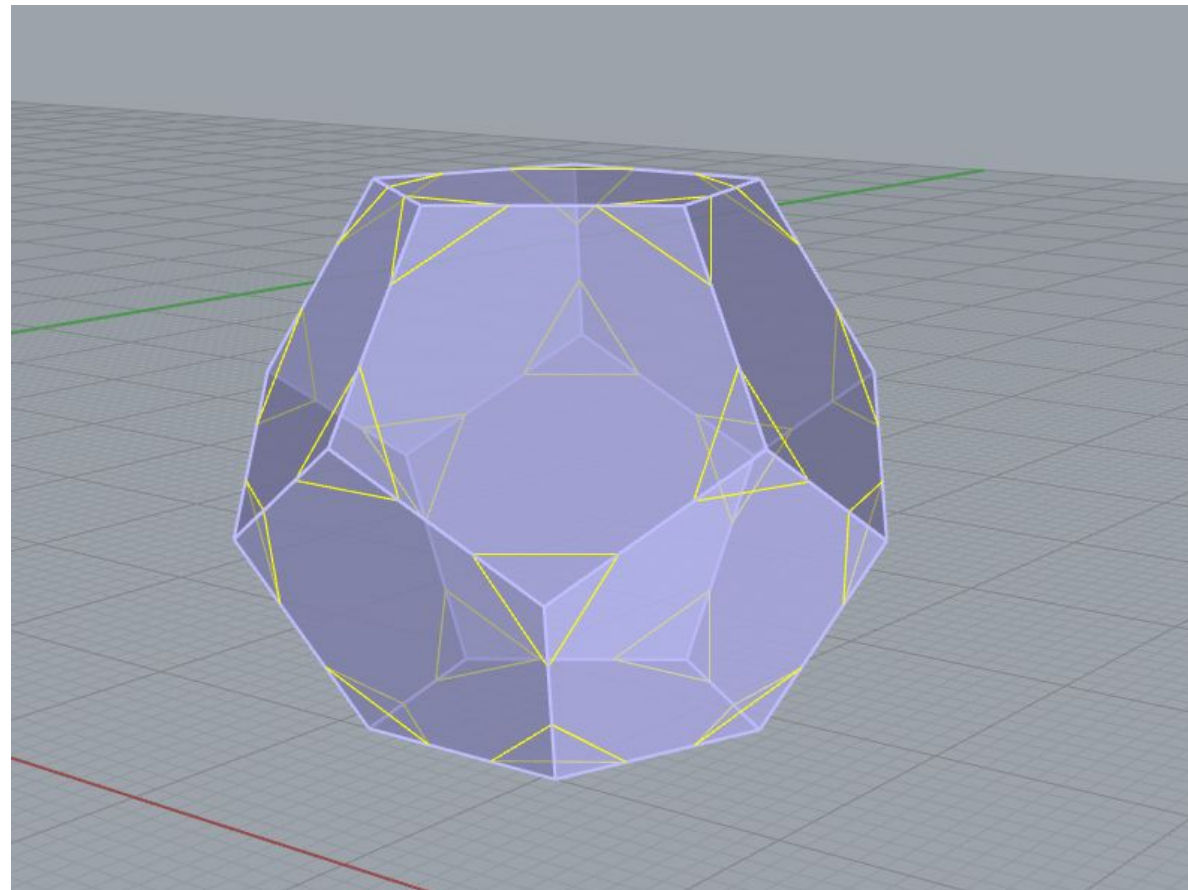
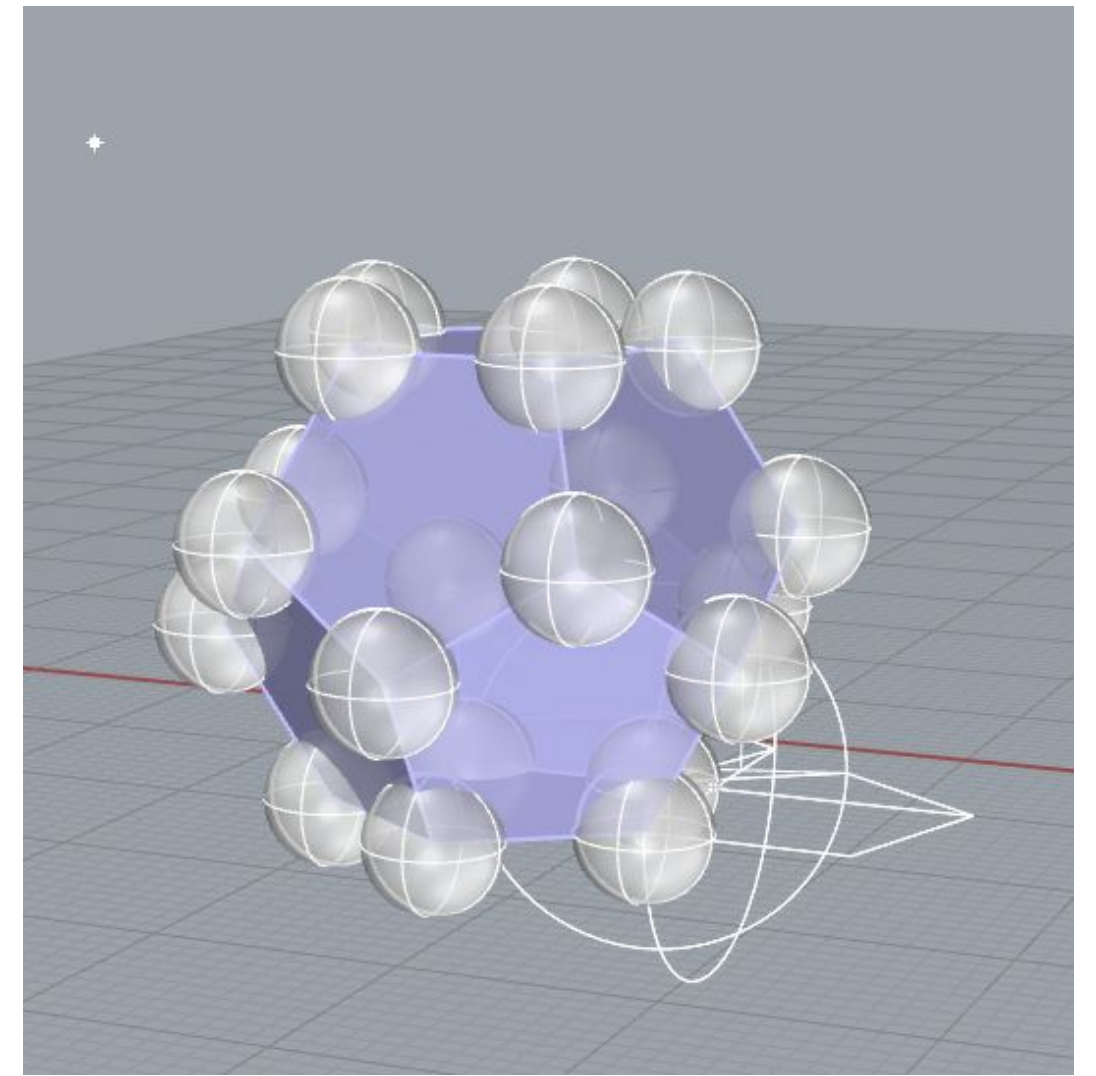
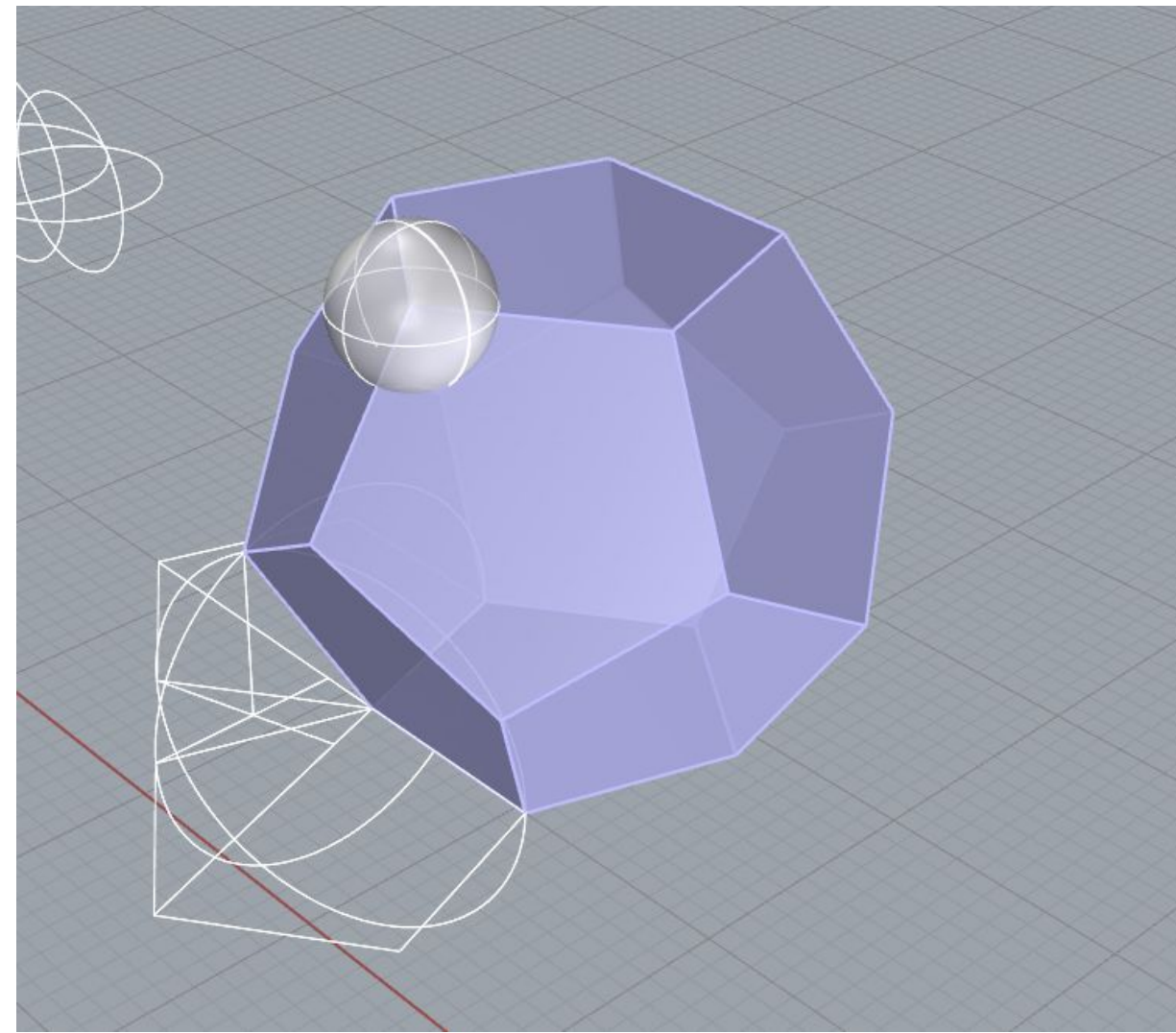
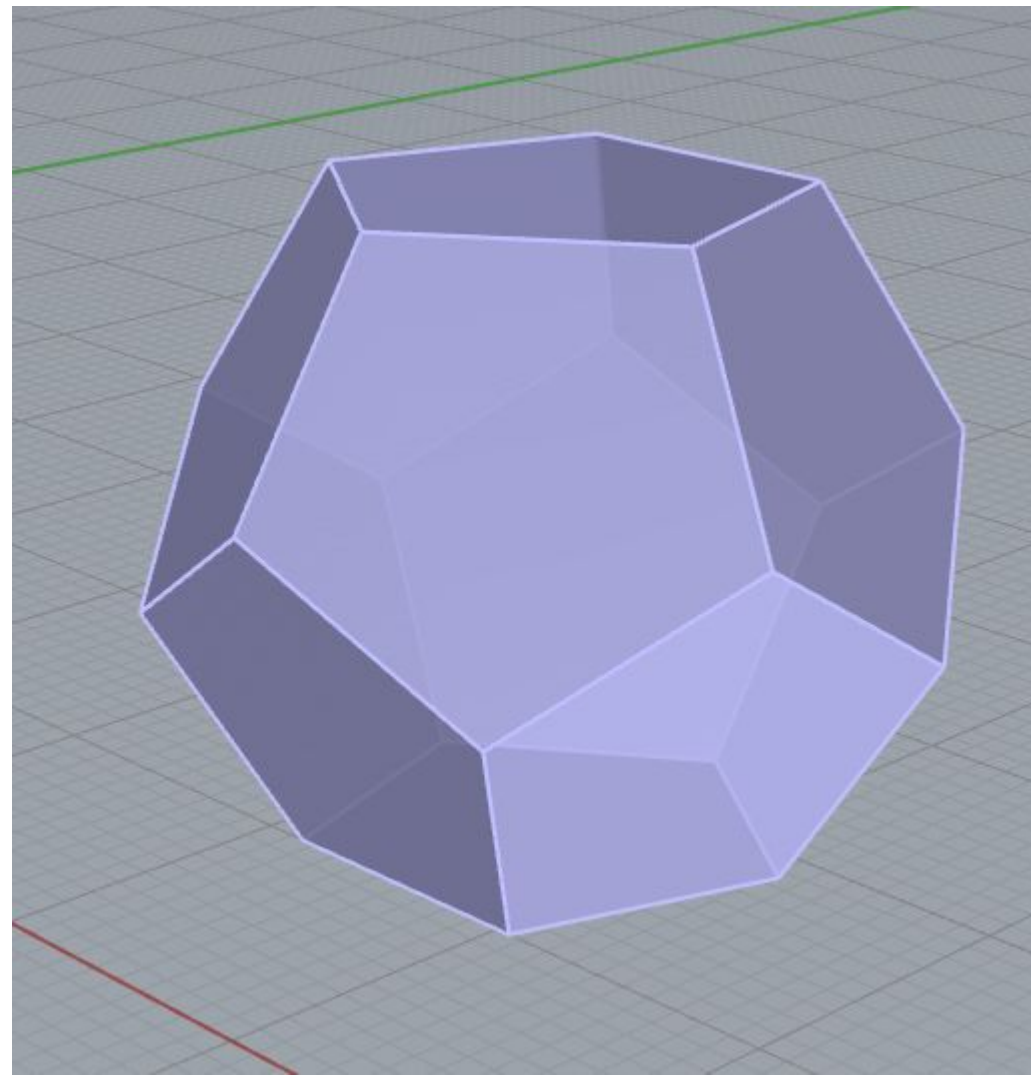
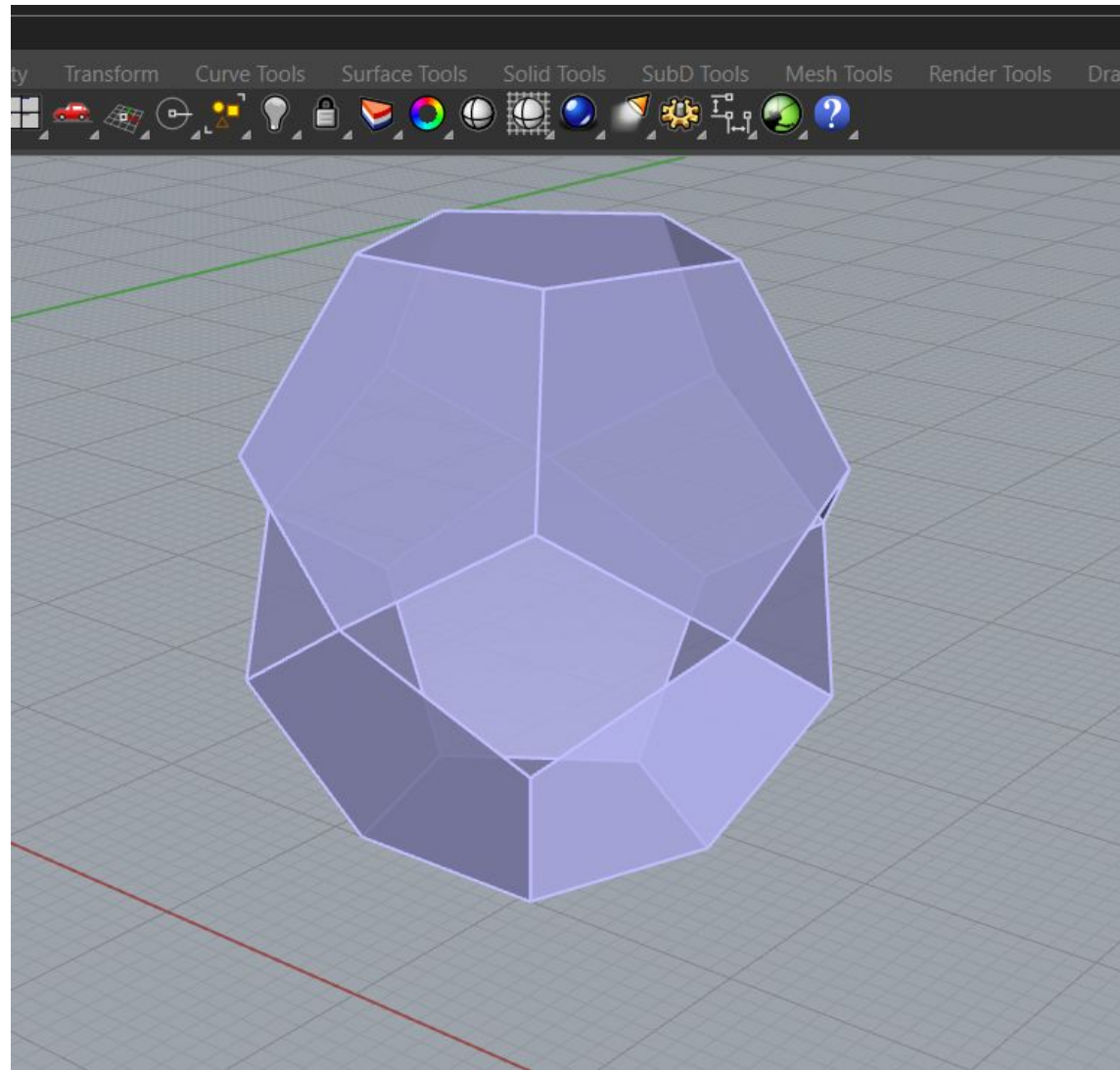
- criara nova layer "points" e "edges"
- multiple points com o botão direito do rato
- colar o rato nos vértices dos sólidos e automaticamente aquilo faz pontos nos centros dos sólidos
- osnap = cen
- criara duas camadas "cubo dual" e "cuboctaedro dual"
- polyline, fazer um triângulo com os pontos dos sólidos
- utilizar o shade para preencher os triângulos de dentro





Dodecaedro



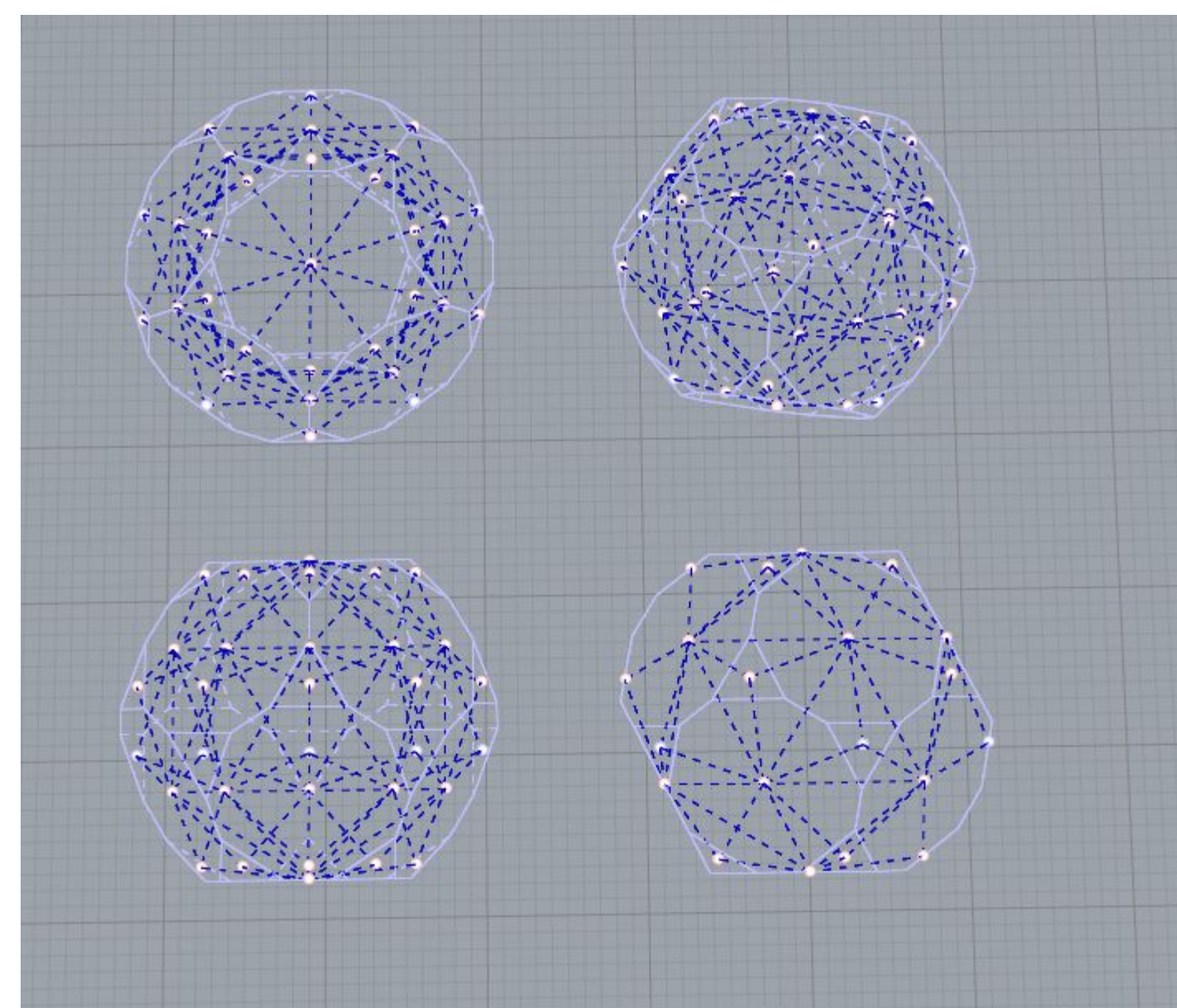
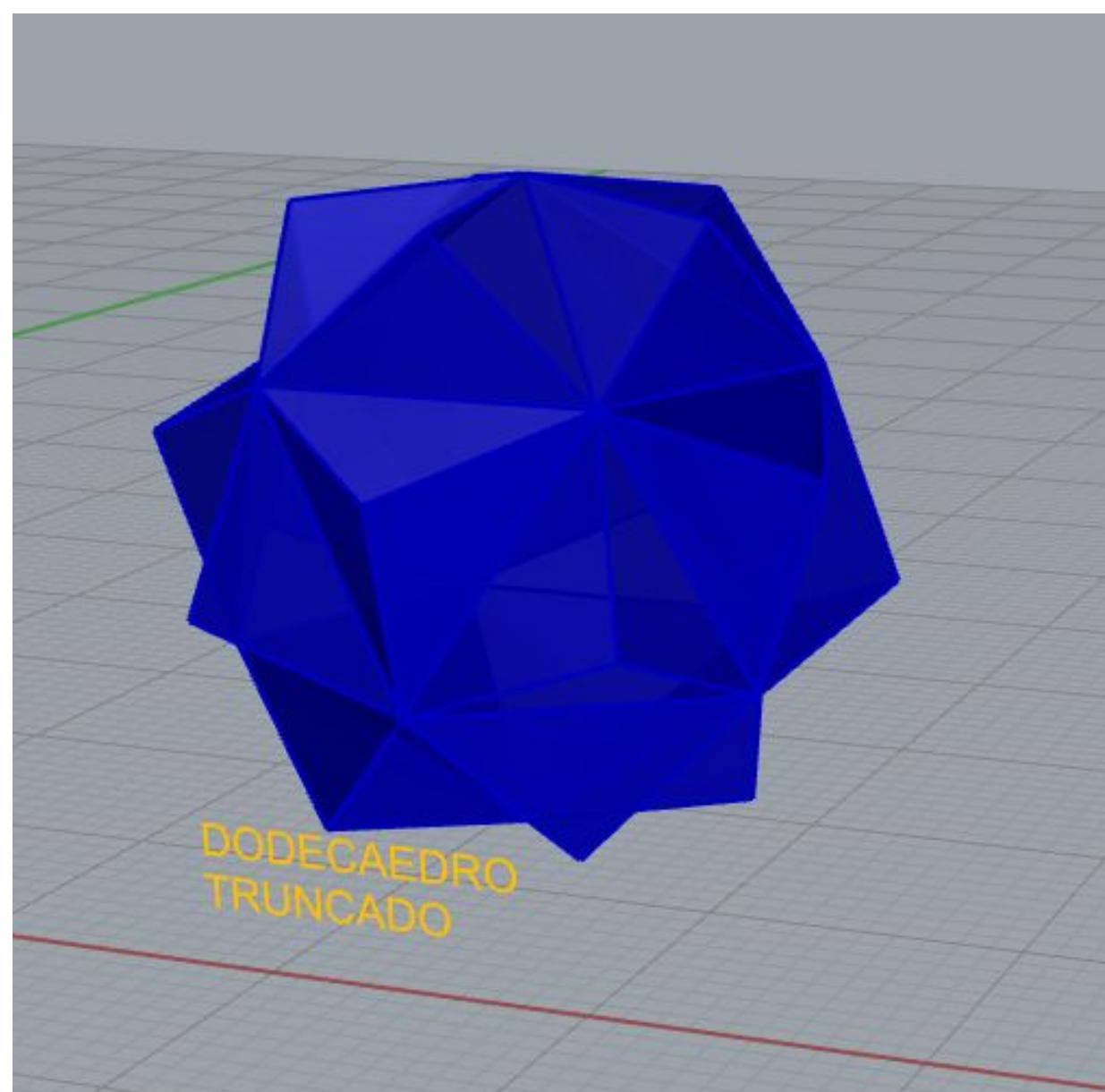
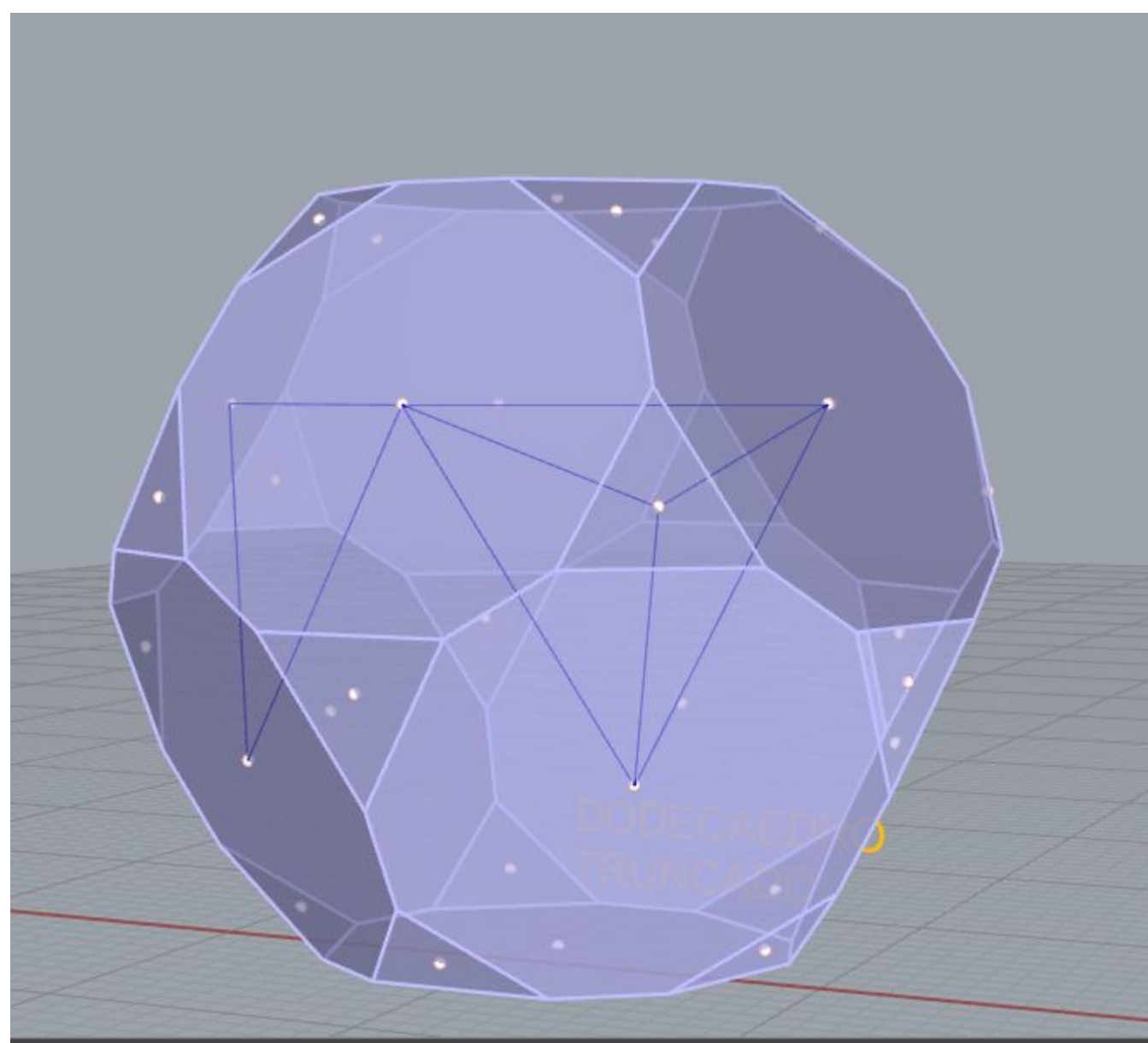


PENTÁGONO
 1. polyline - enter
 @9<0 enter
 @9<72 enter
 @9<144 enter
 @9<216 enter
 c (close) enter

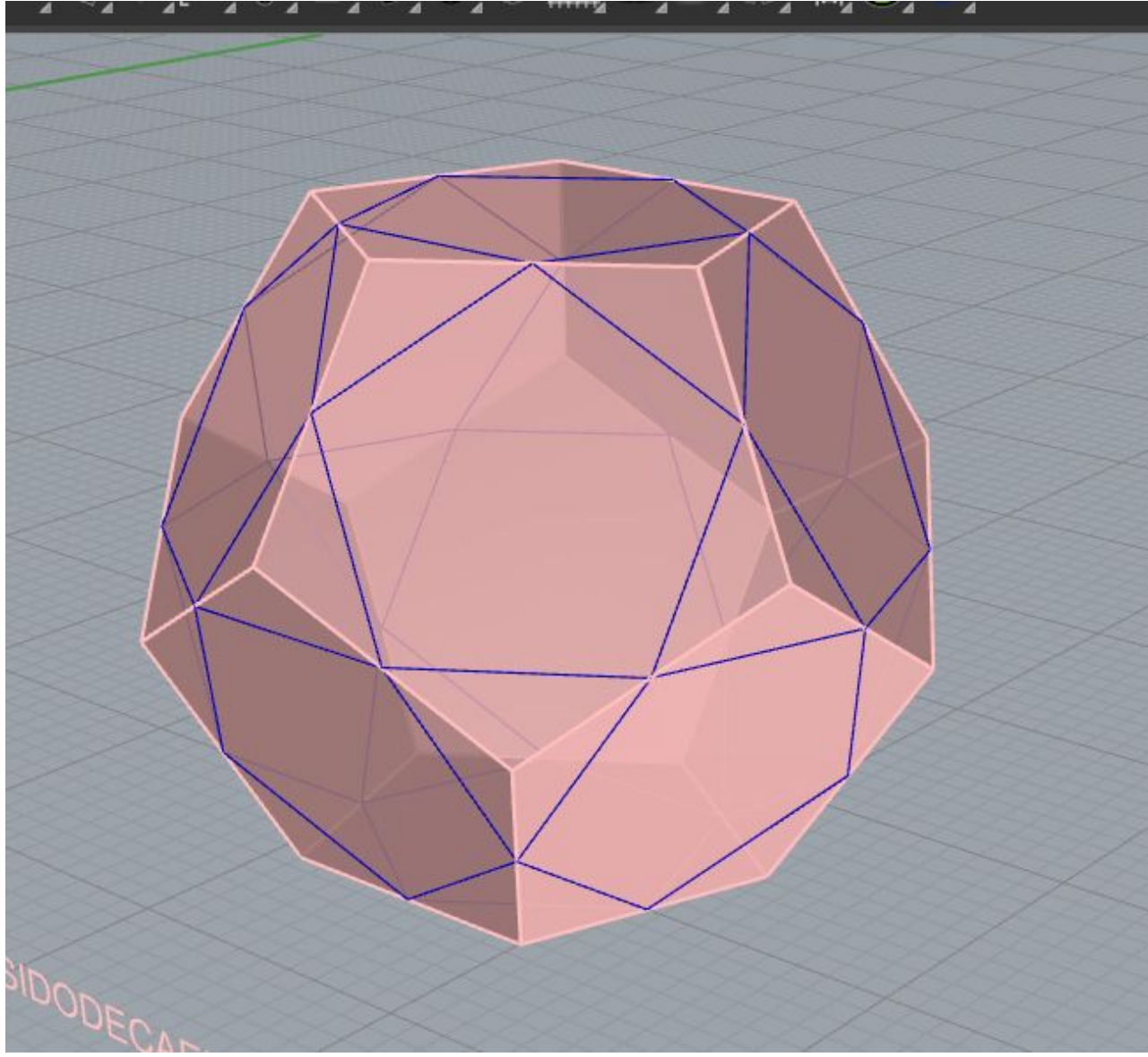
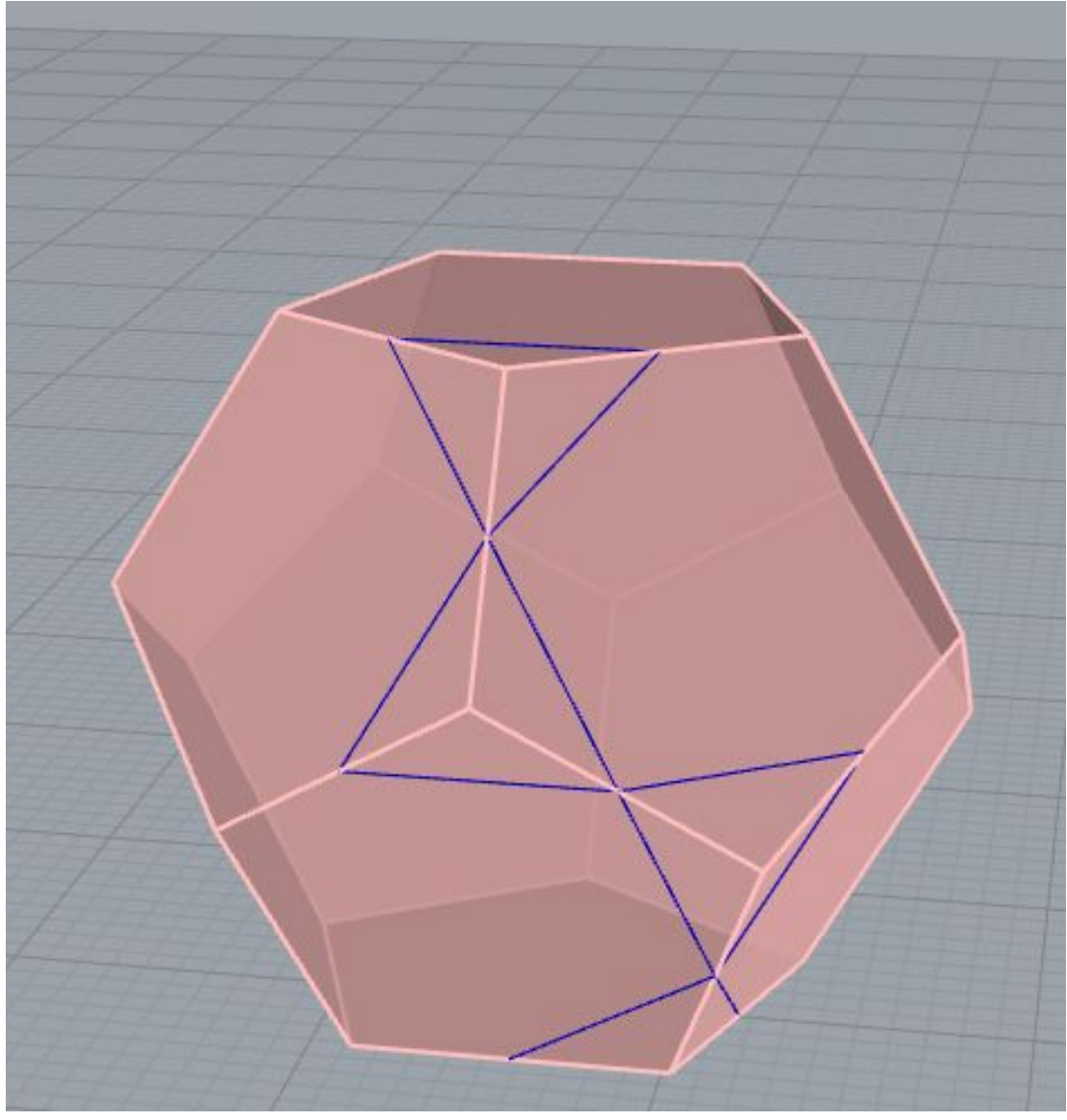
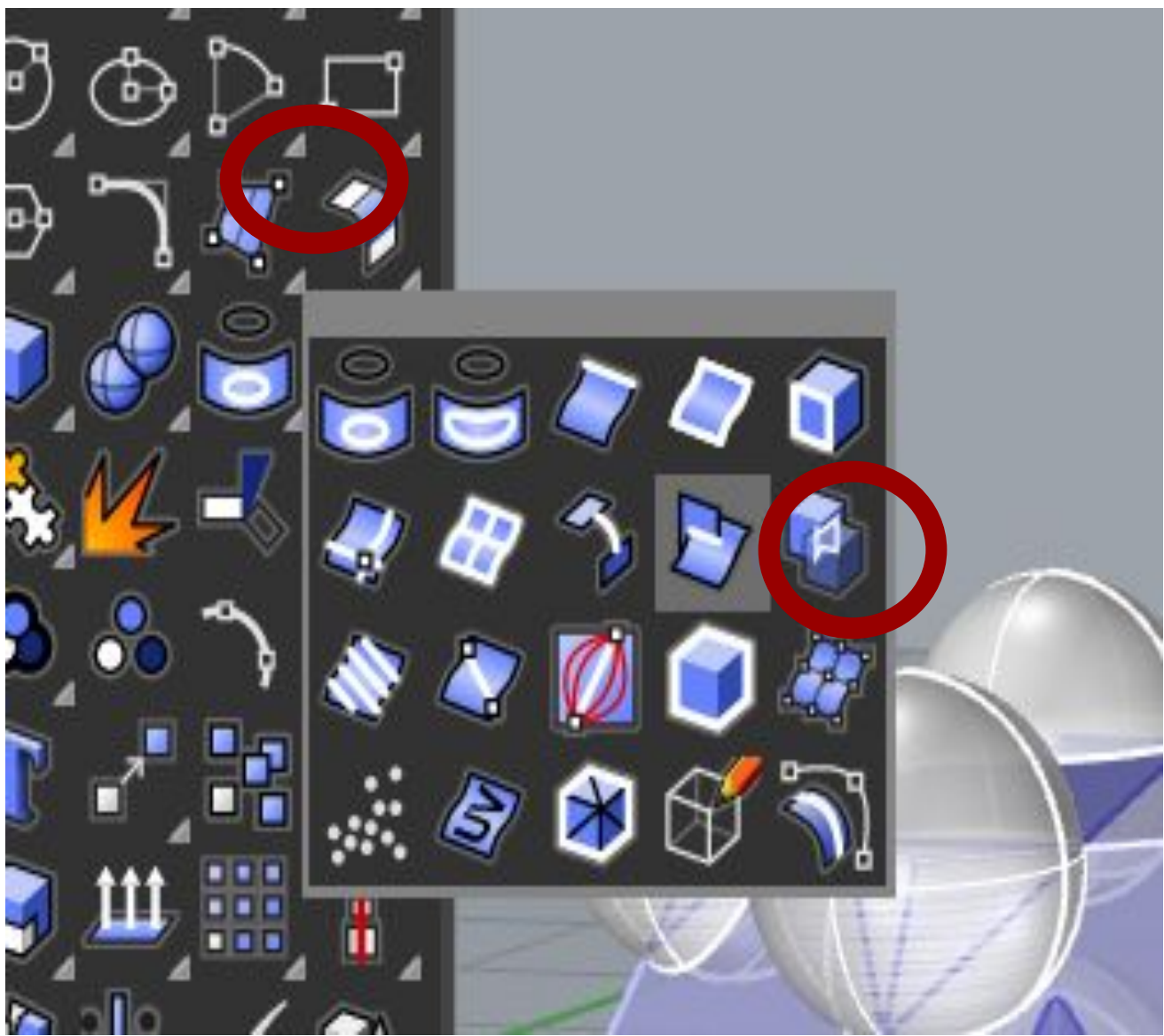
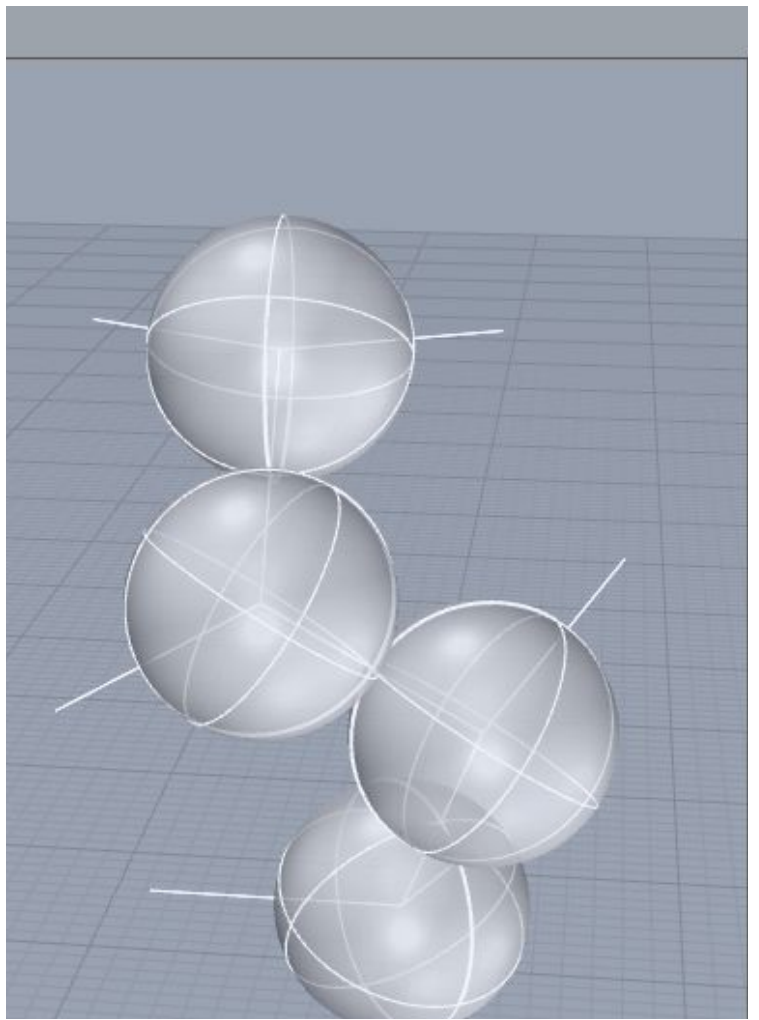
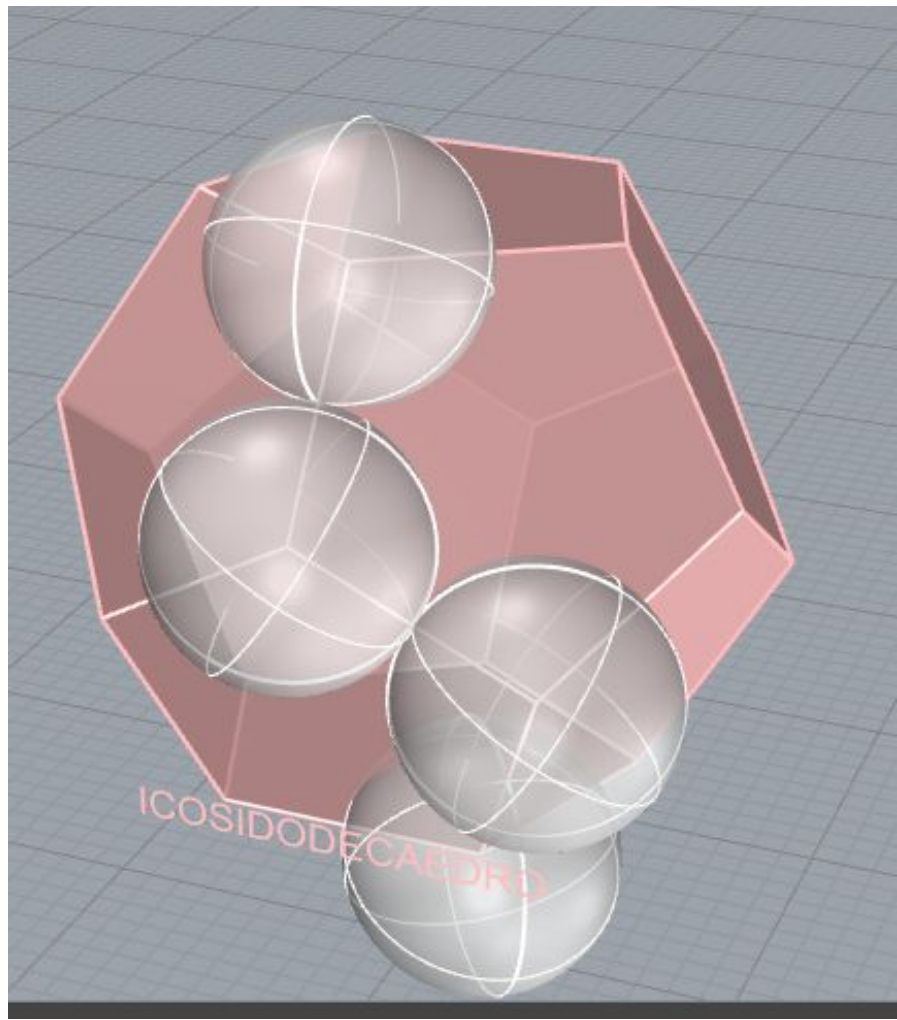
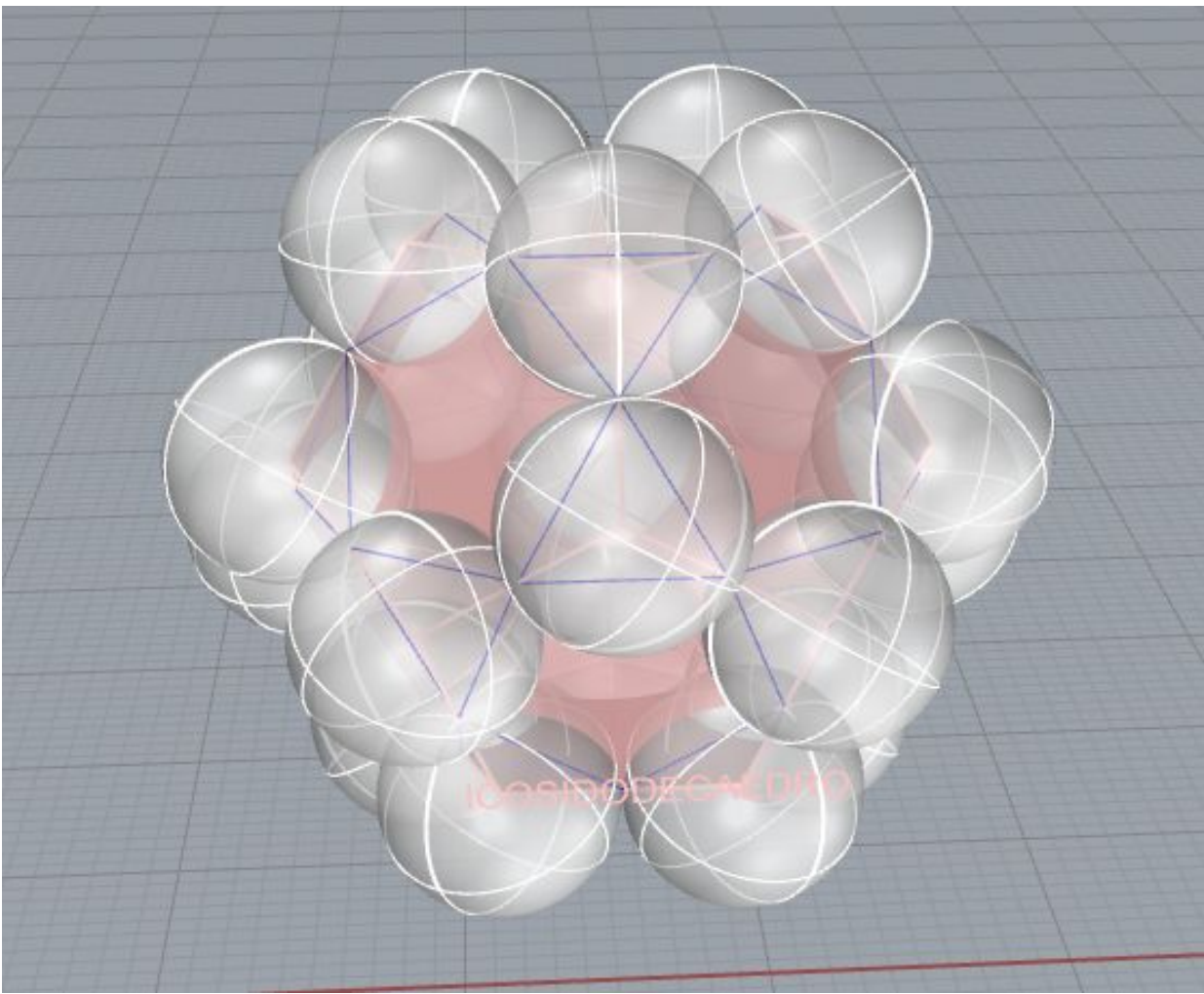
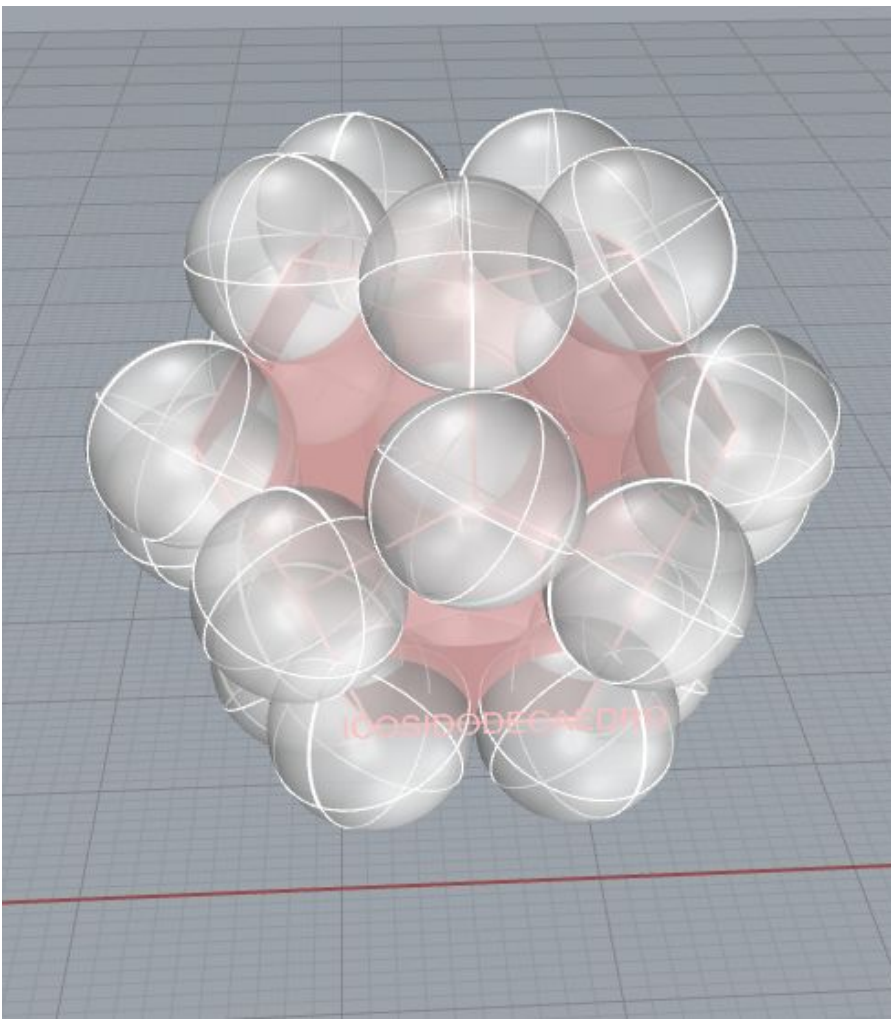
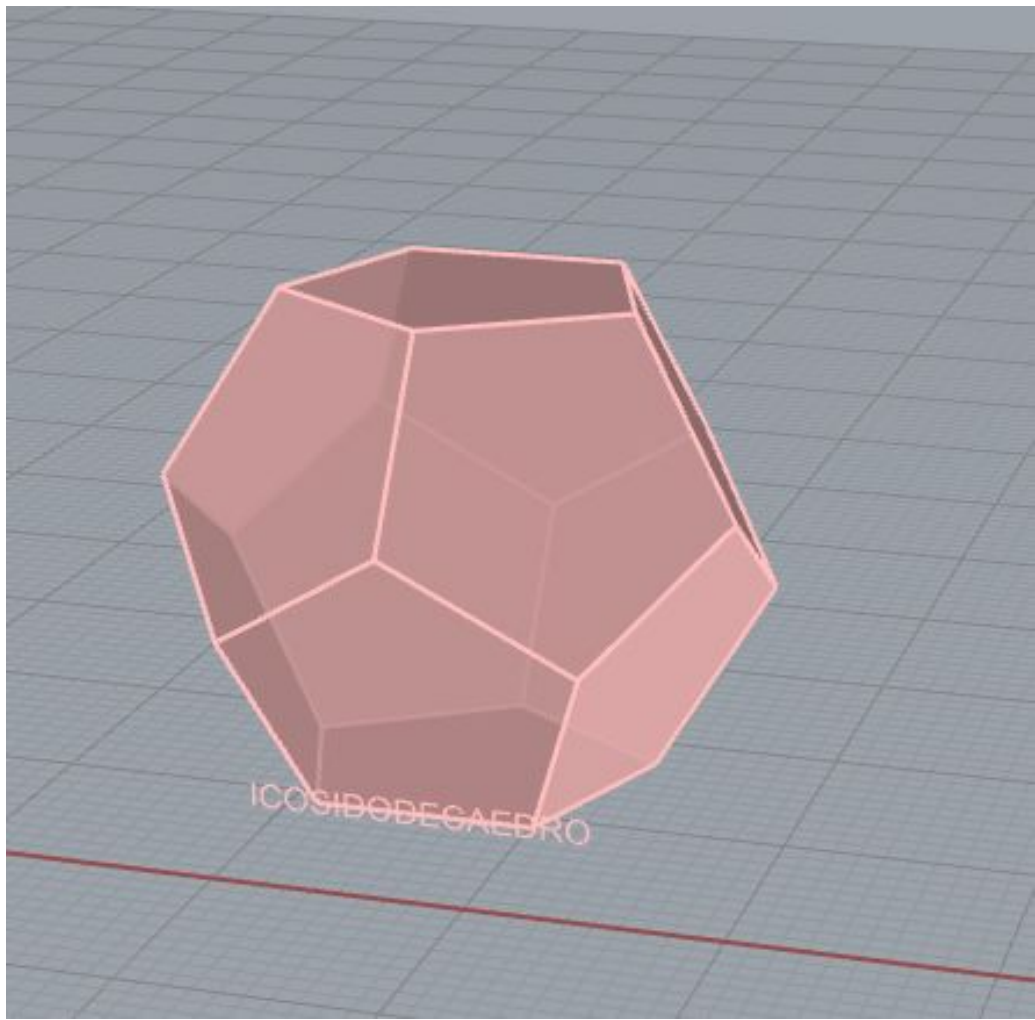
- mirror do pentágono
- fazer duas lines
- nessas lines fazer retas perpendiculares
- circunferência, vertical, fazer das duas retas perpendiculares
- osnap- int - fazer uma line que linha as linhas iniciais que se cruzam e os círculos
- shade- triangulozinho, segunda opção, fazer shade dos pentagonos
- rotate3d, selecionar a face do pentagono que está ligada à face da base, e selecionamos o vértice que queremos puxar para cima até onde os 2 círculos se intersejam (fazer isso com as duas faces)

- mirror da face de fora selecionando sempre de baixo para cima
- mirror do objeto, 3 pontos, selecionar 3 pontos mais altos
- rotate, encontrar o centro da face de cima e da face de baixo, 36, enter
- move, arrastar para baixo
- ir ao triangulozinho da "box" selecionar o 3 (círculo), selecionar um vértice, 3, enter, fazer em todos os vértices
- opção ao lado da "box", triangulozinho, 2 opção, selcionar um circulo, selecionar o sólido, "yes" lá em cima, enter
- fazer em todos os círculos (é feito um corte na interseção do circulo com o sólido)
- unir com a polyline cada ponto de interseção de cada circunferência até formarem triângulos

Dodecaedro - DUAL



Icosidodecaedro- DUAL



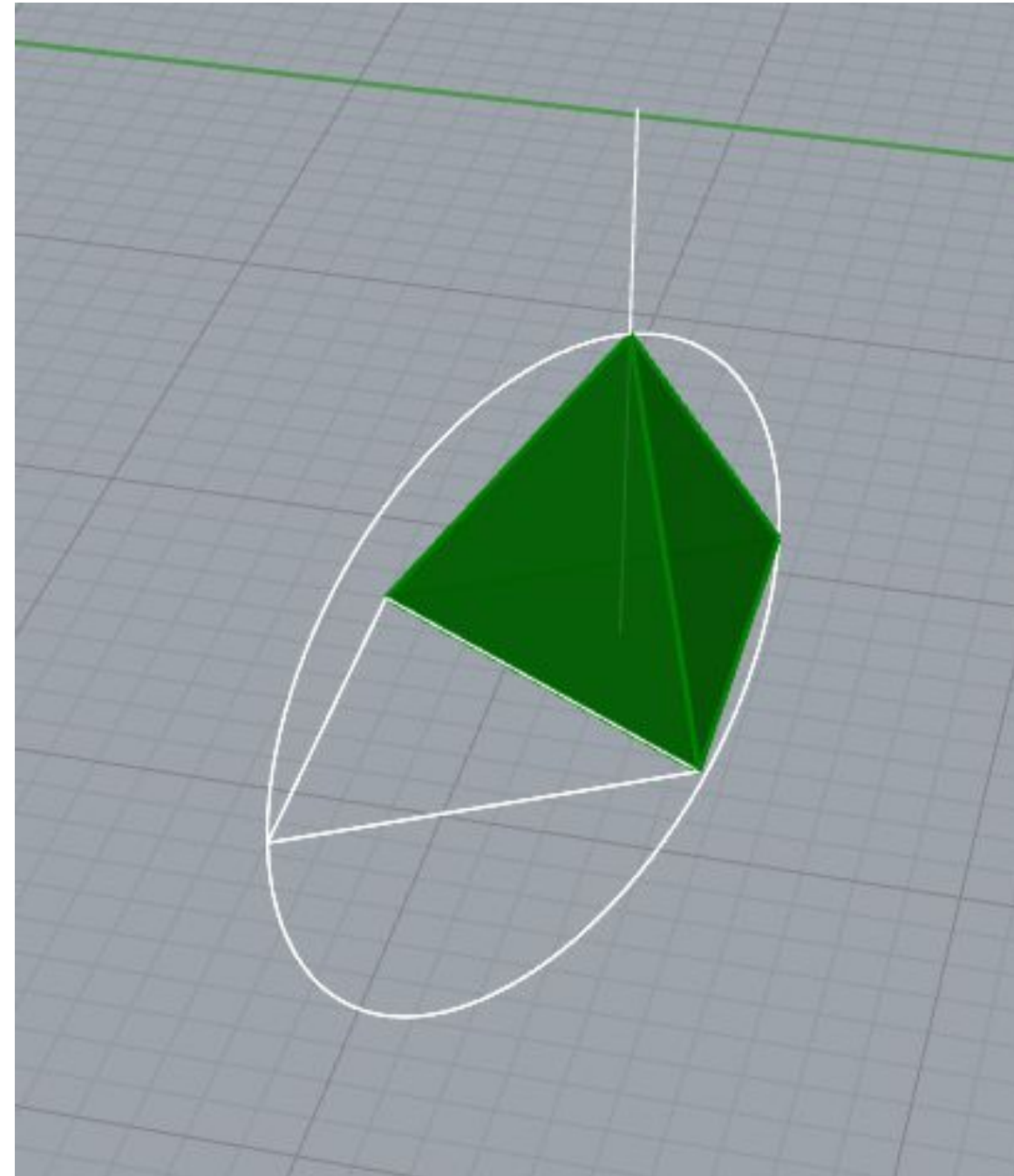
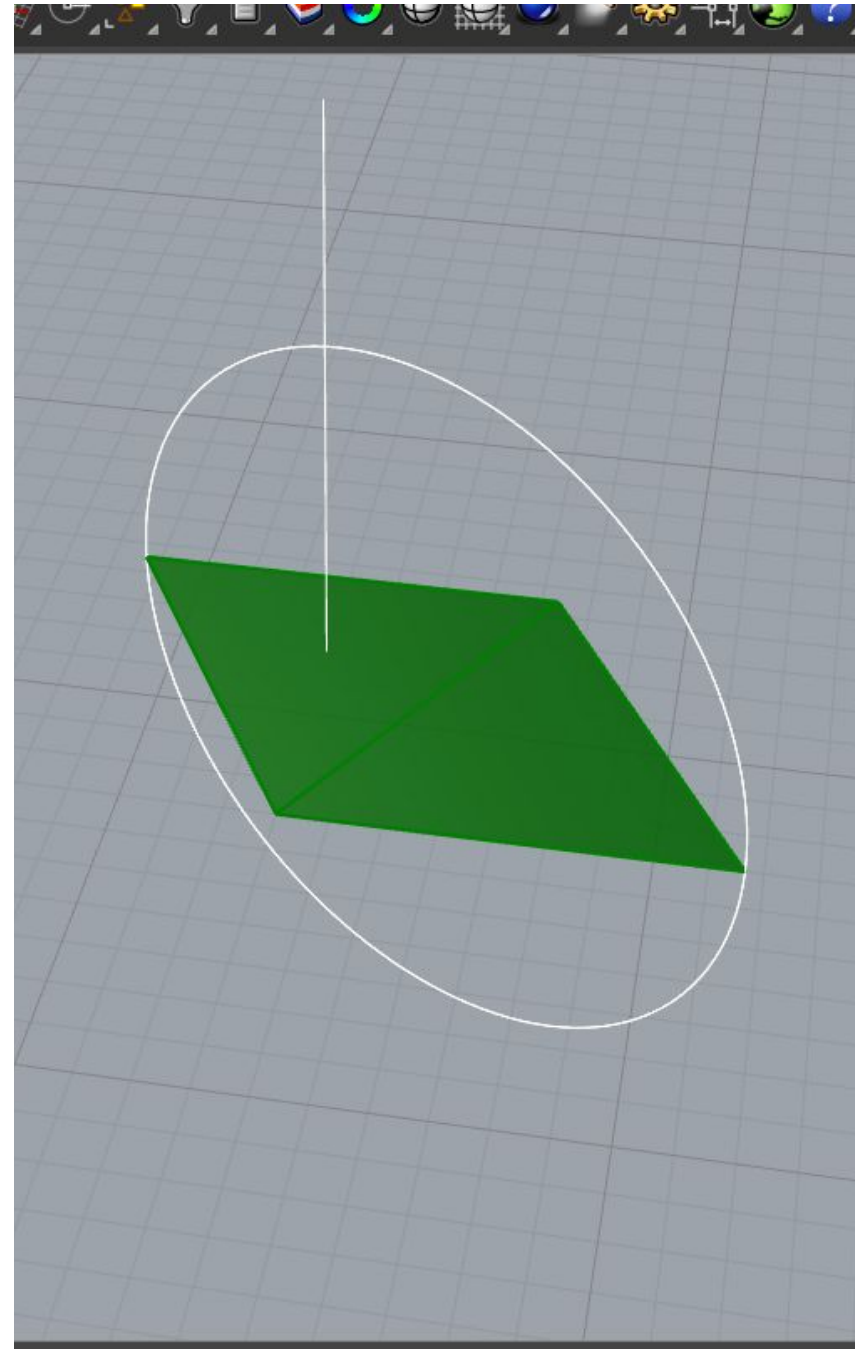
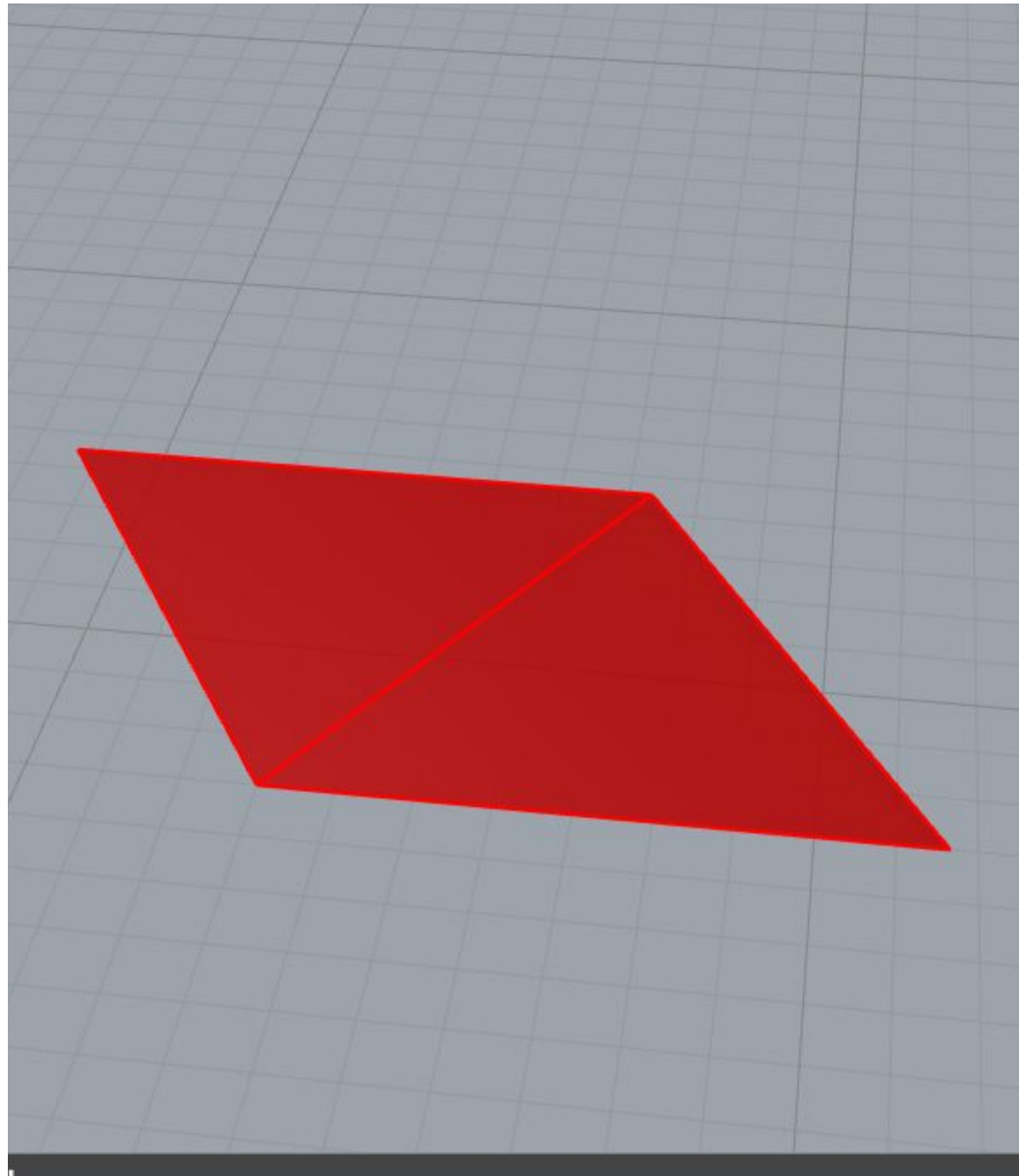
ICOSIDODECAEDRO

- fazer os mesmos passos que o dodecaedro até ter o sólido
- fazer os círculos nos vértices do sólido até metade da aresta
- fazer os círculos em dois vértices de cima e em dois de baixo (4 círculos), fazer com a polyline o contorno das aresta que tocam essas 4 circunferências, fazer object intersection dos círculos e do contorno
- fazer os triângulos
- fazer arraypolar, selecionar os 4 triângulos, selecionar o centro da base, 5, 360, enter

ICOSIDODECAEDRO DUAL

- fazer os pontos em cada fase do sólido
- polyline

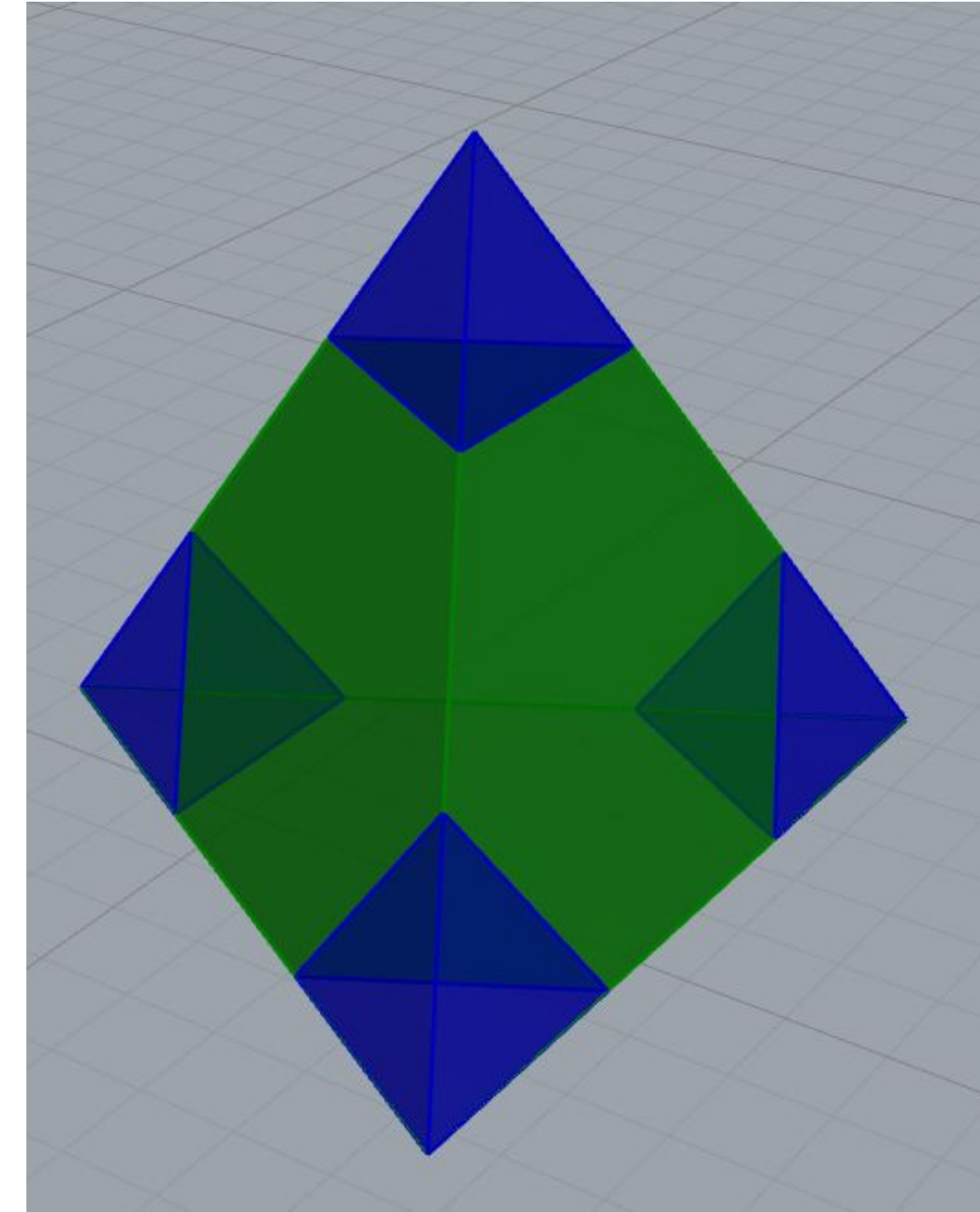
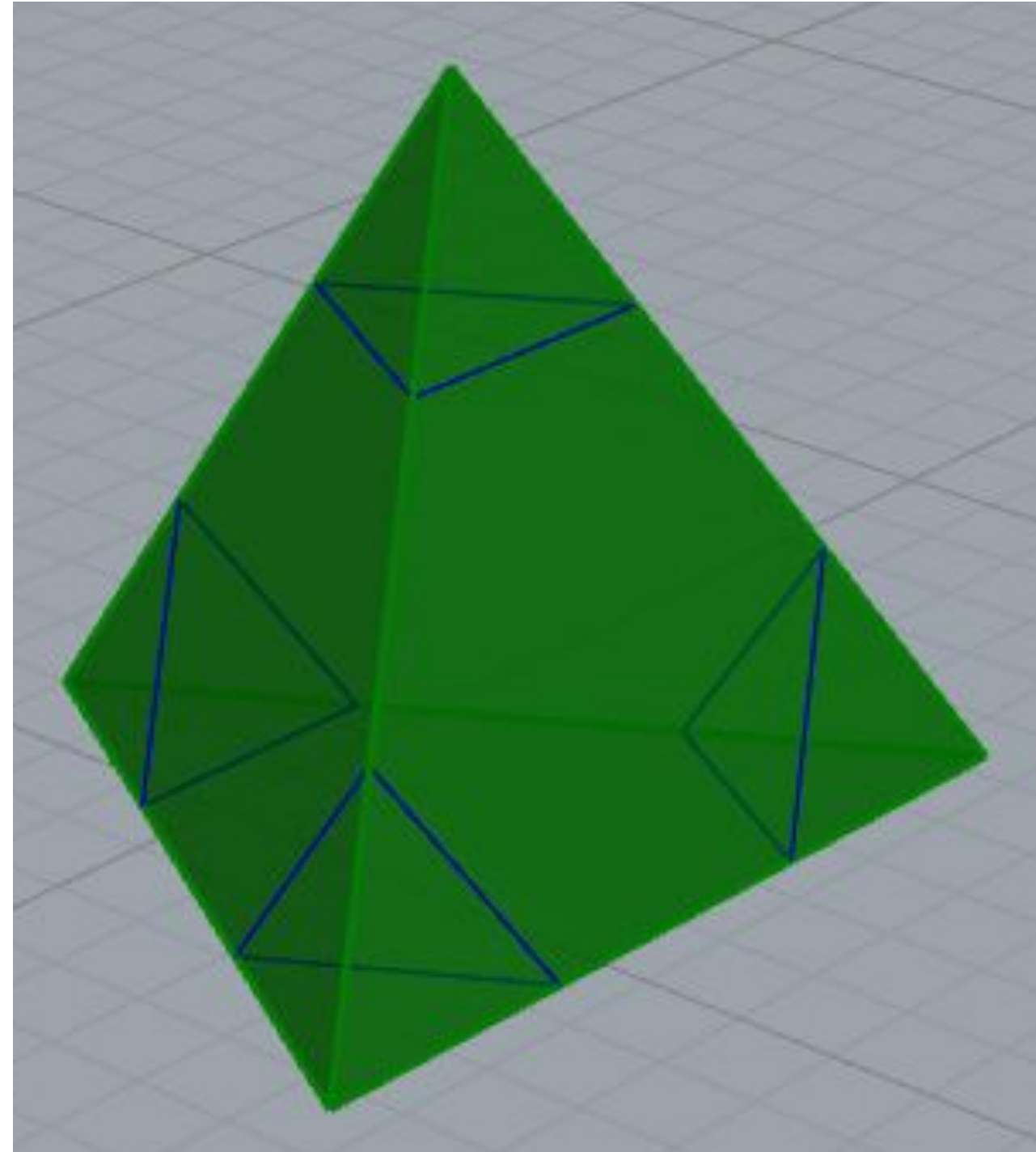
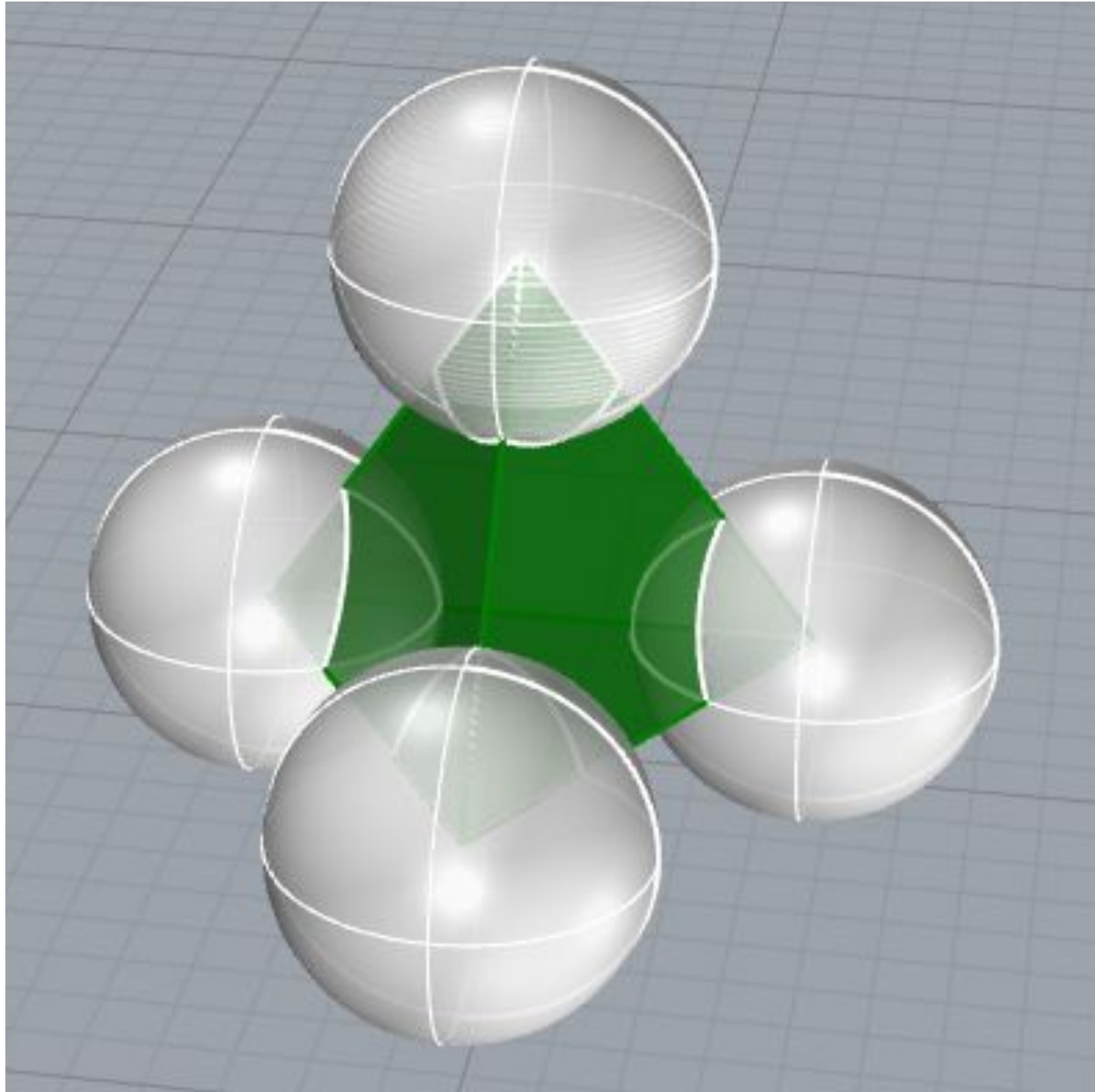
Tetraedro



TETRAEDRO

- "polygon , center, radius", selecionar o primeiro item em cima, 3, (fazer o triângulo)
- Pintar o triângulo
- mirror
- encontrar o centro de um dos triângulos, vertical, e fazer uma linha sem medida
- fazer uma circunferência vertical, desde o midpoint da linha que une os dois triângulos e o vértice da ponta
- 3drotate
- mirror

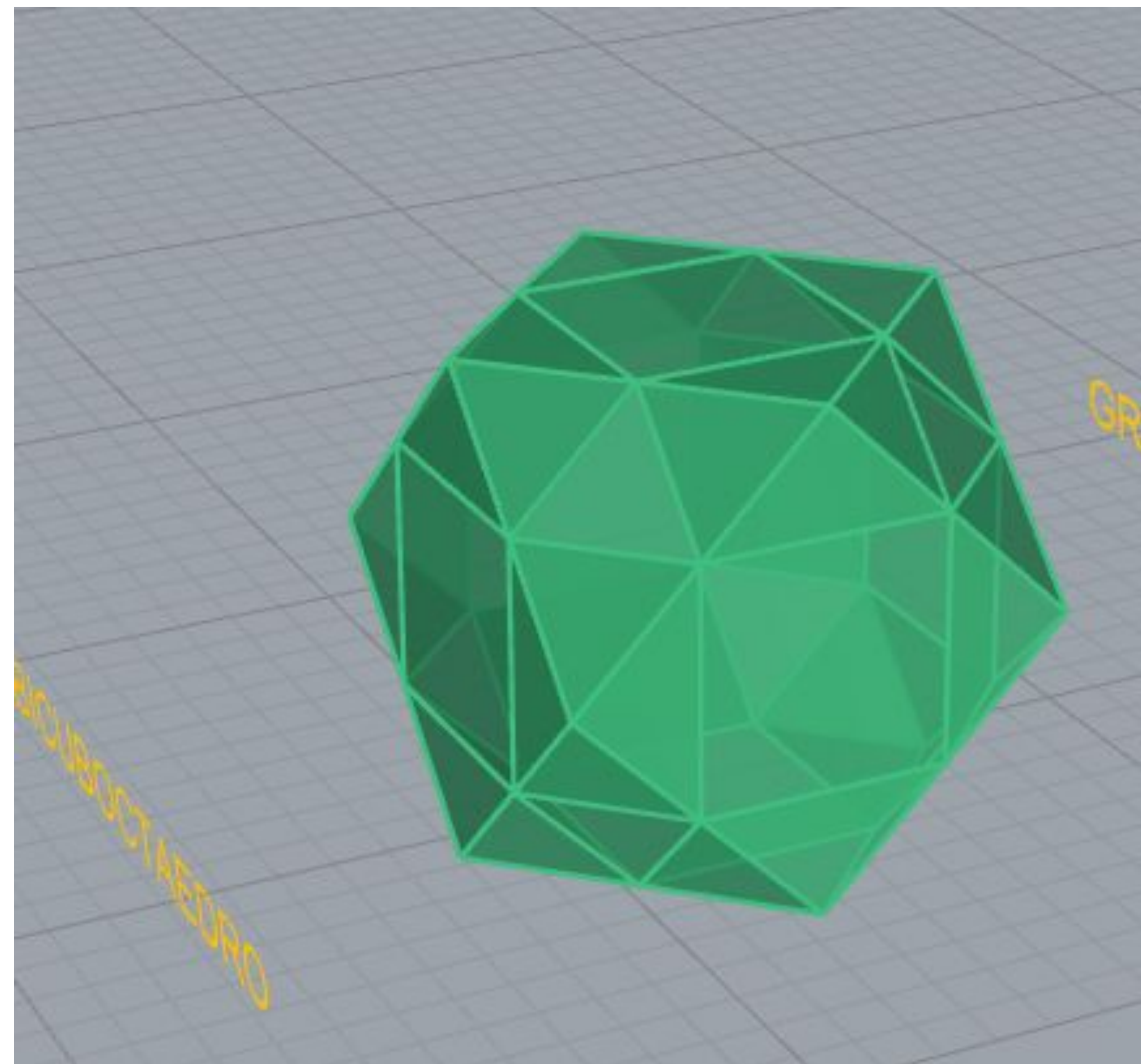
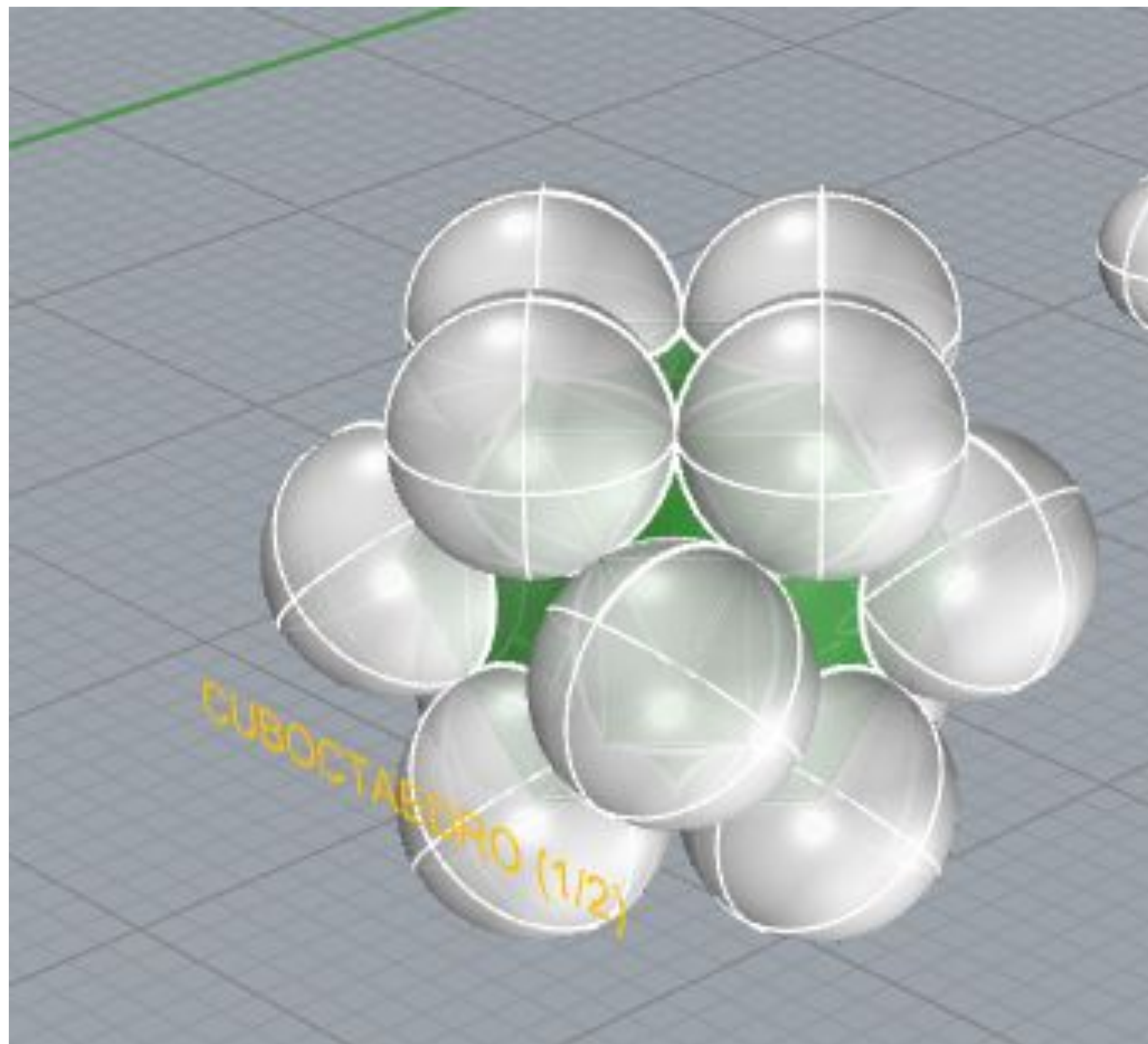
Tetraedro Truncado



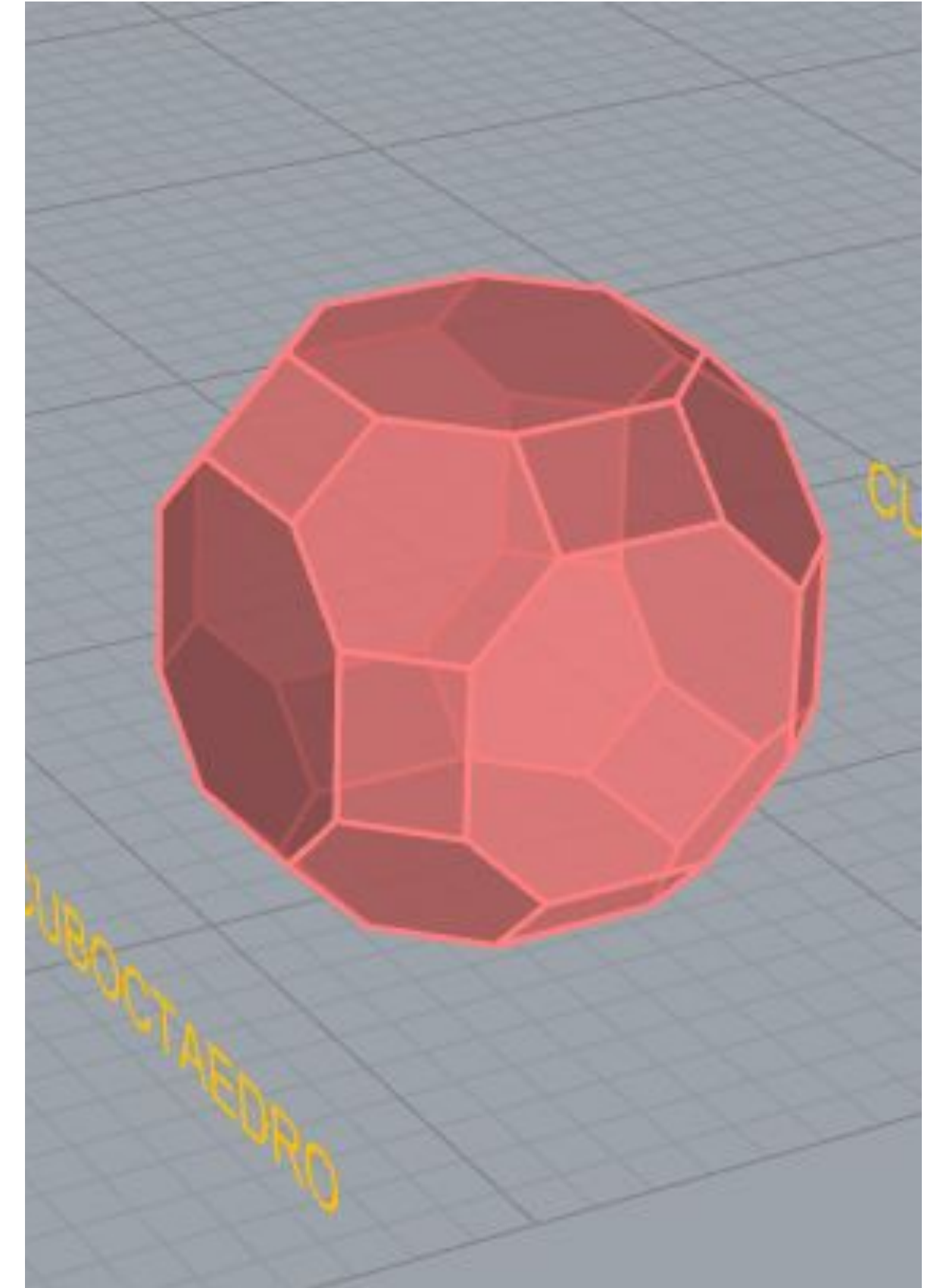
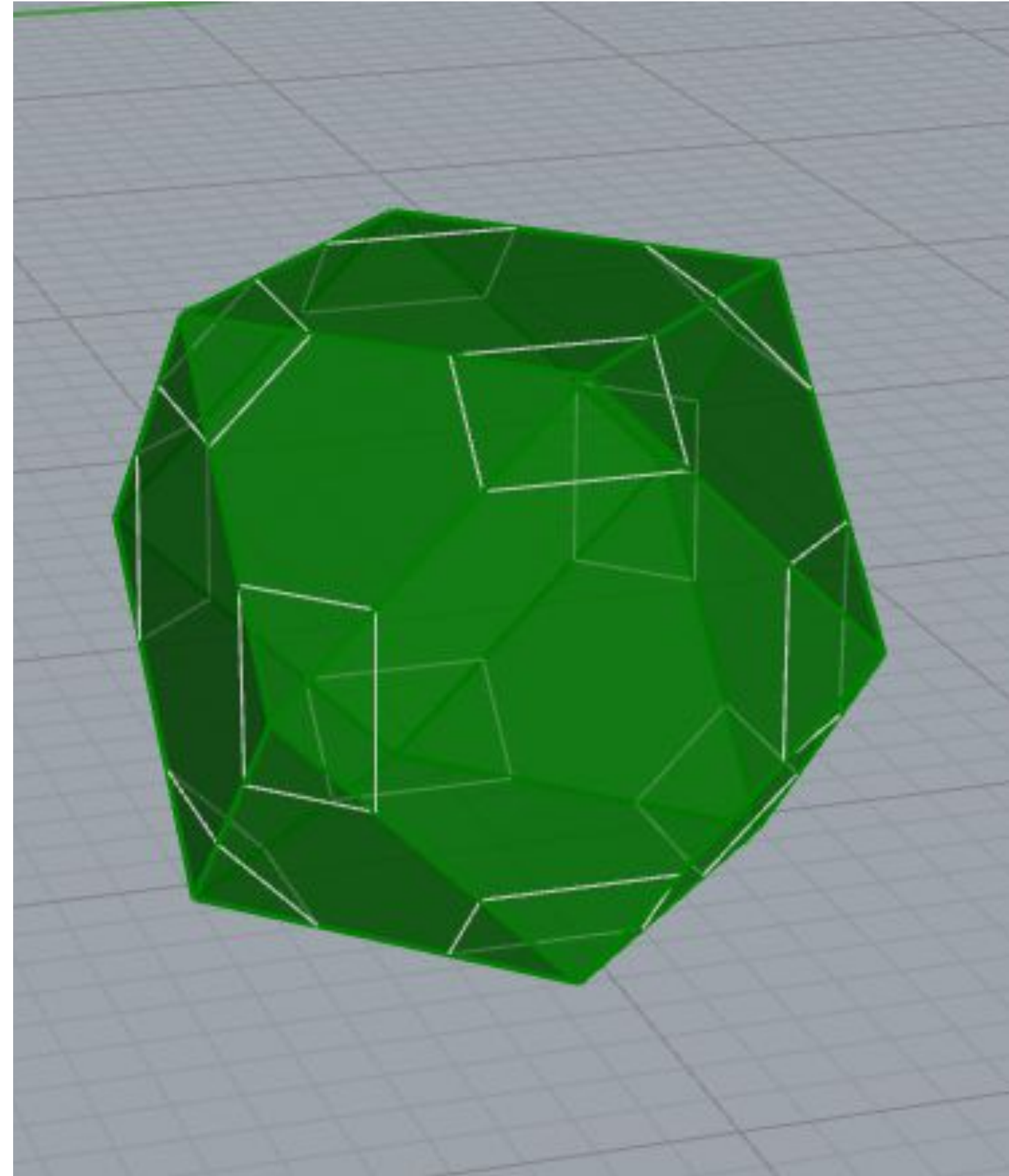
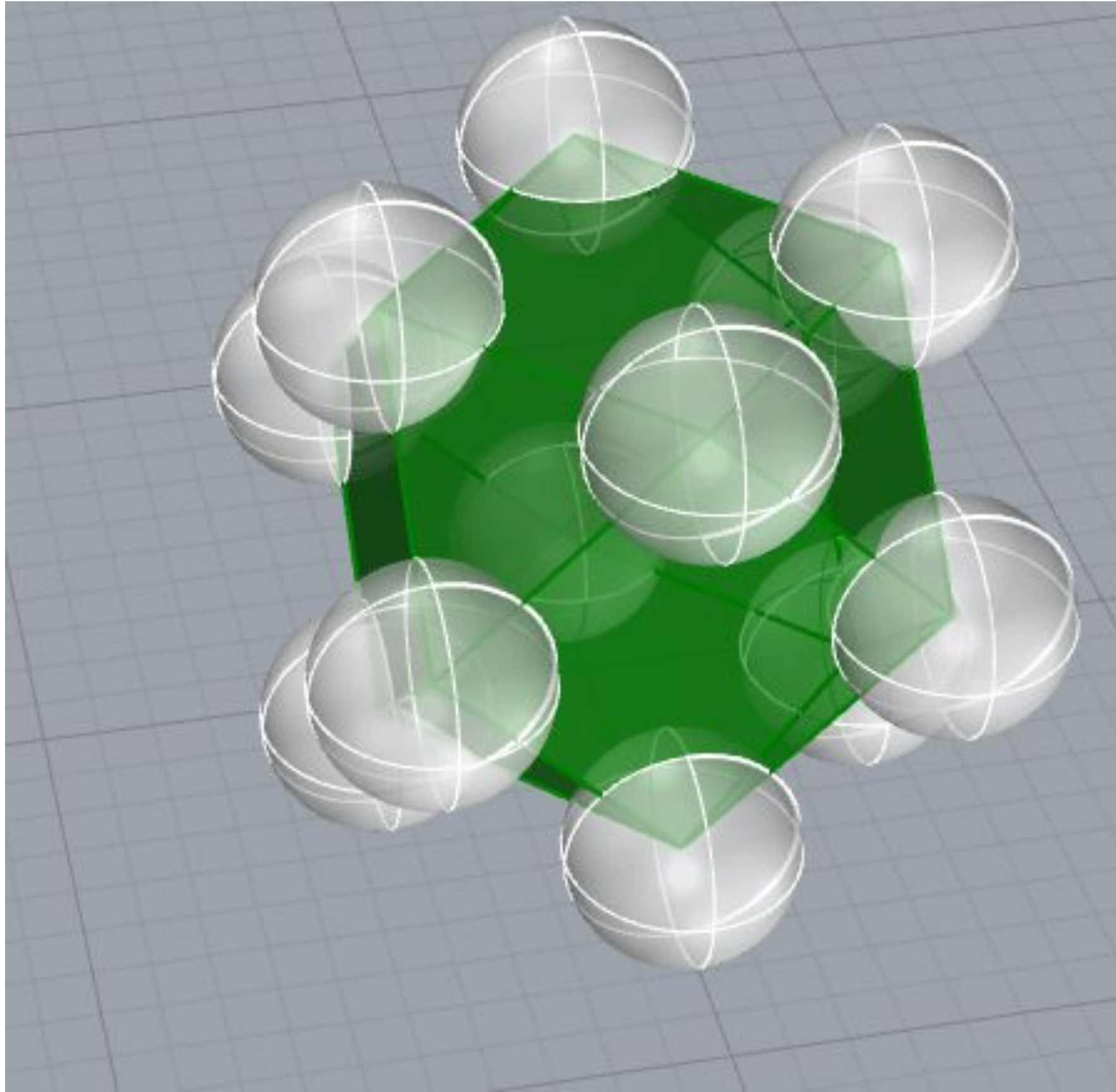
TETRAEDRO TRUNCADO

- mesmo que a medida colocada inicialmente tenha sido 5, a distancia passou para 8.6cm
- fazer as circunferências a $\frac{1}{3}$ nas arestas (logo $8.6 \div 3 = 2.8$)
- fazer a interseção das circunferências com o sólido
- fazer as arestas
- wirecut

ROMBICUBOCTAEDRO

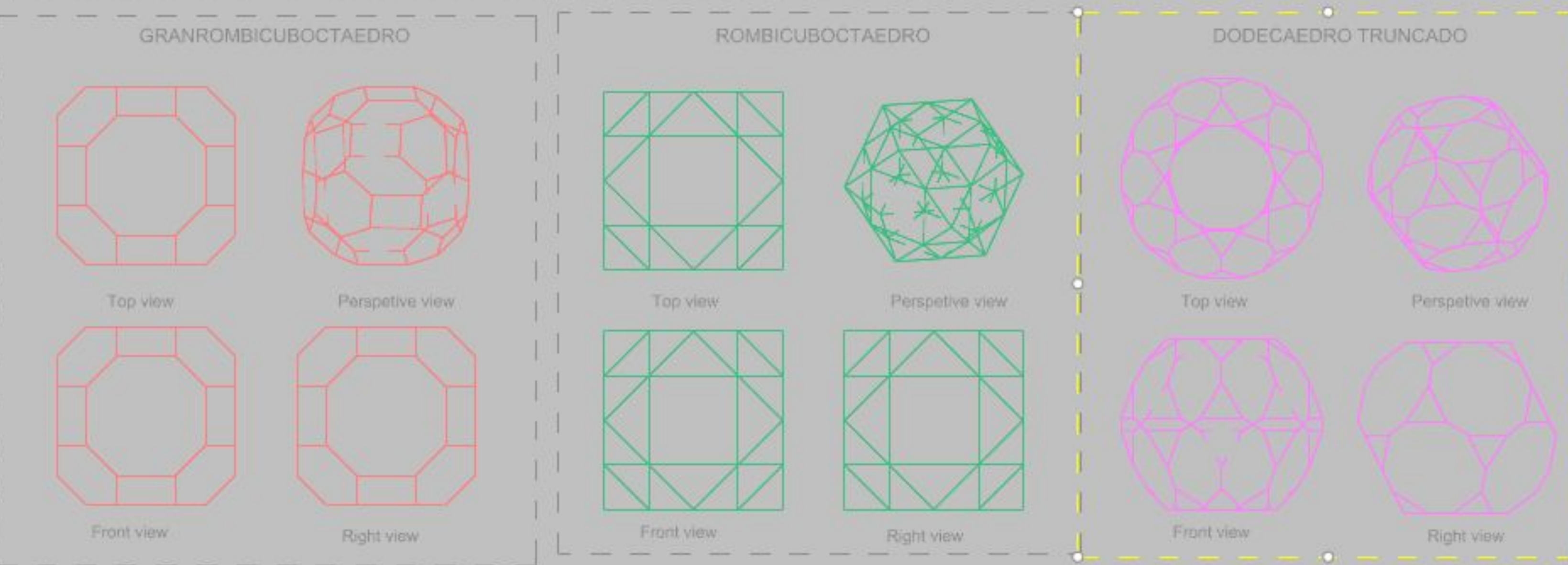
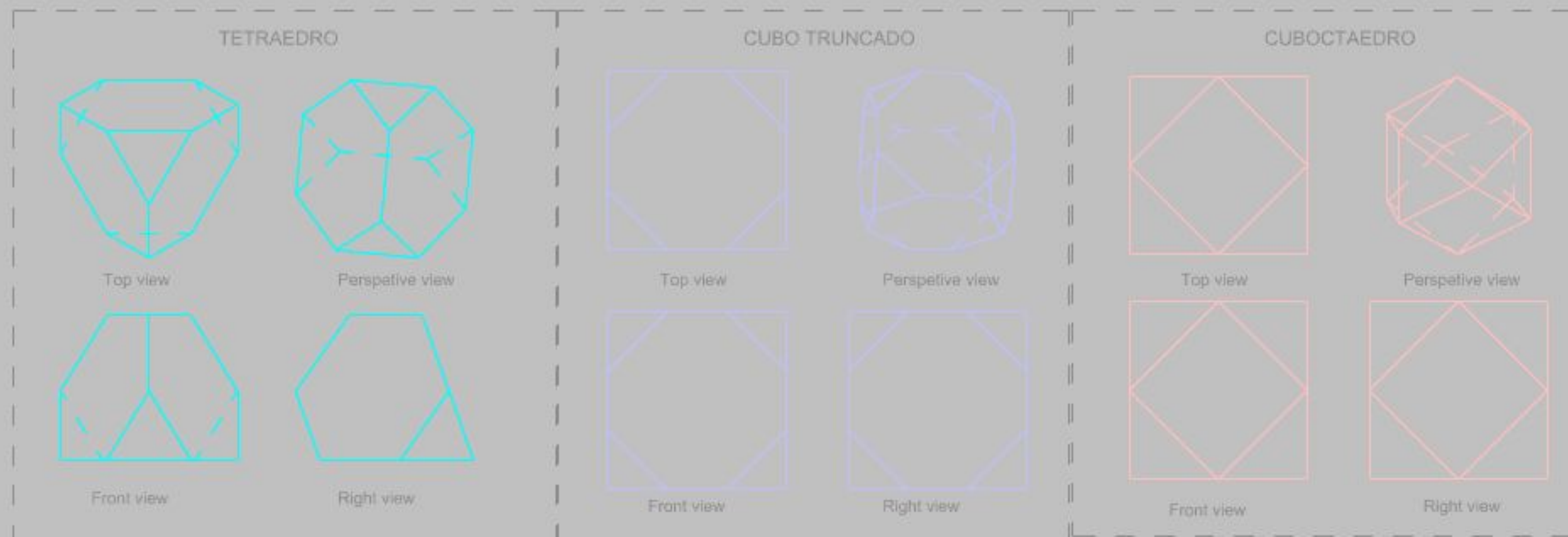


GRANROMBICUBOCTAEDRO



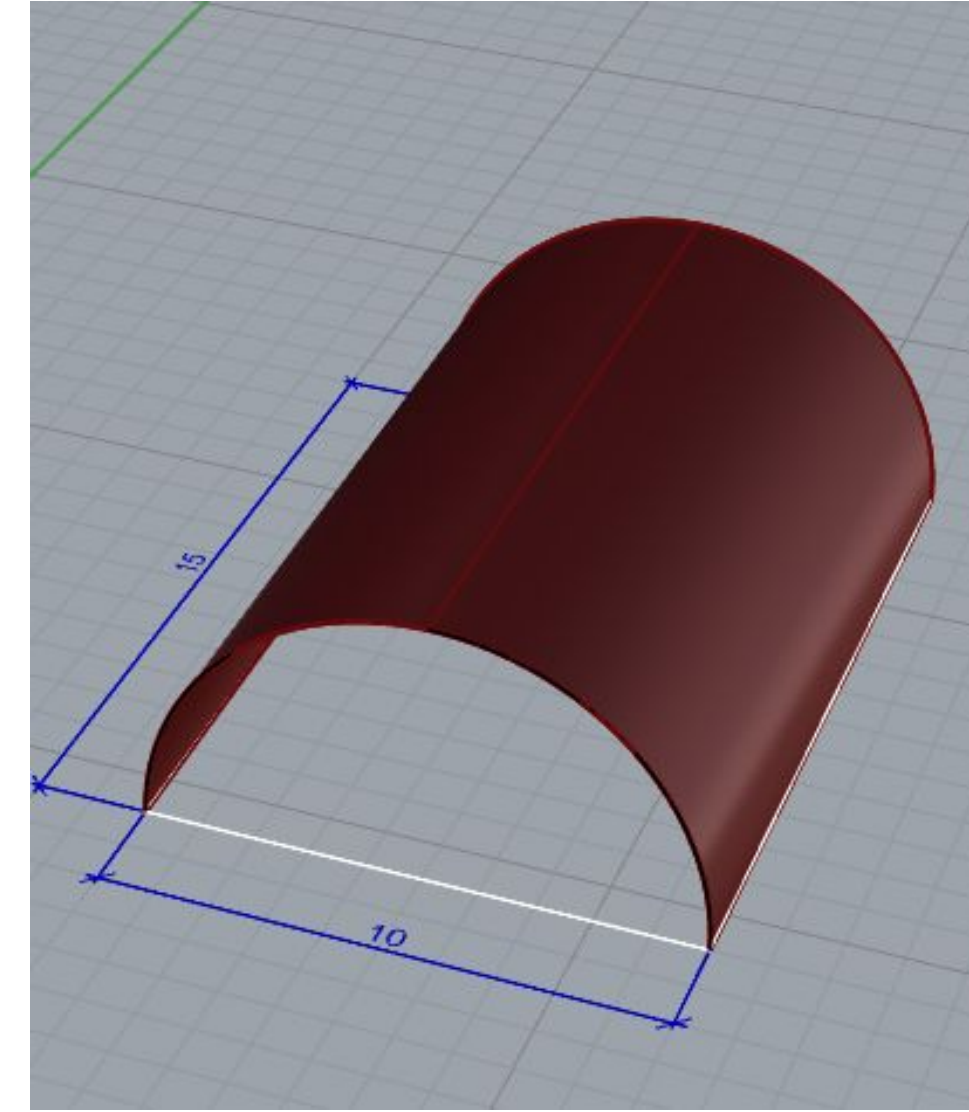
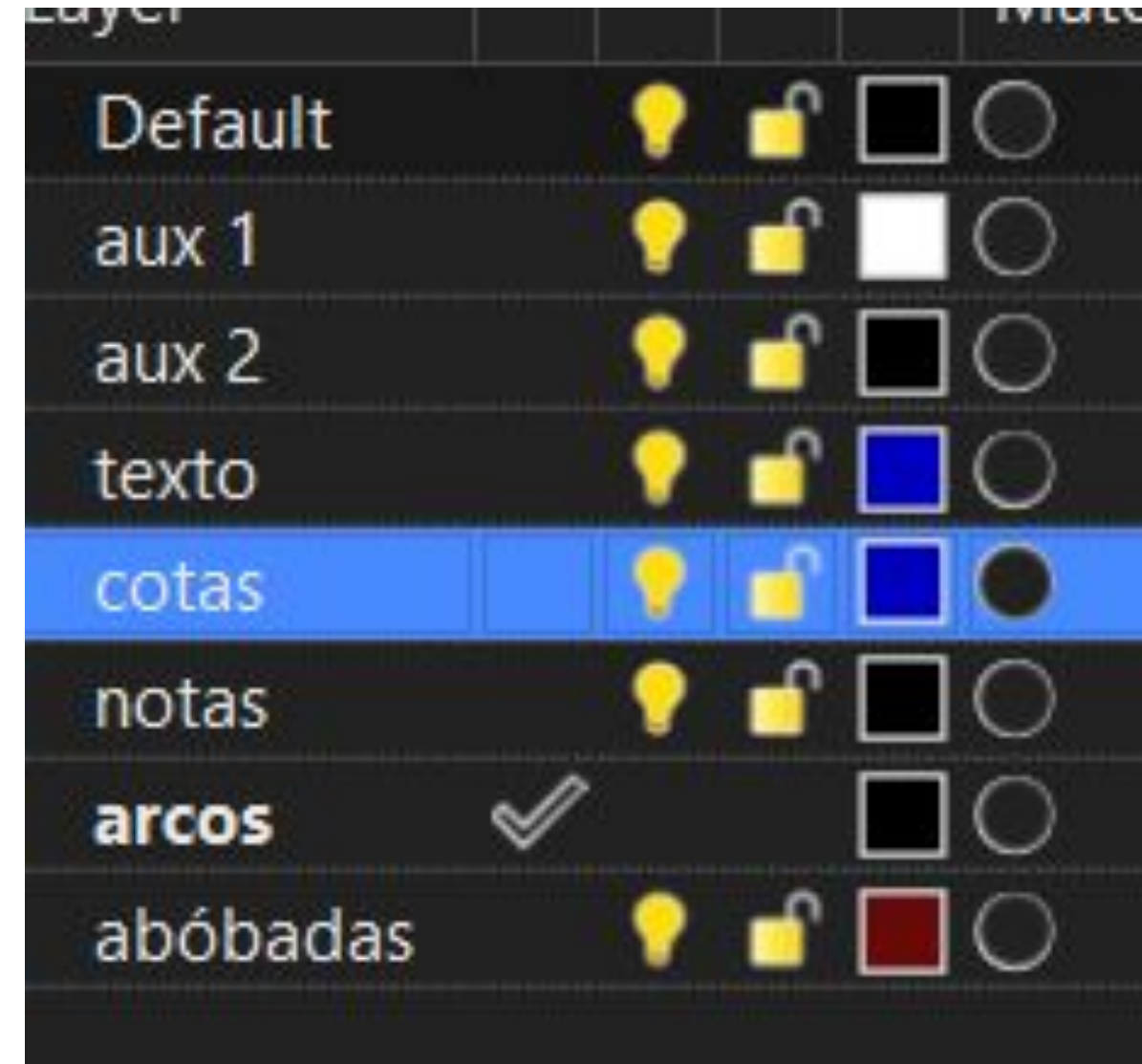
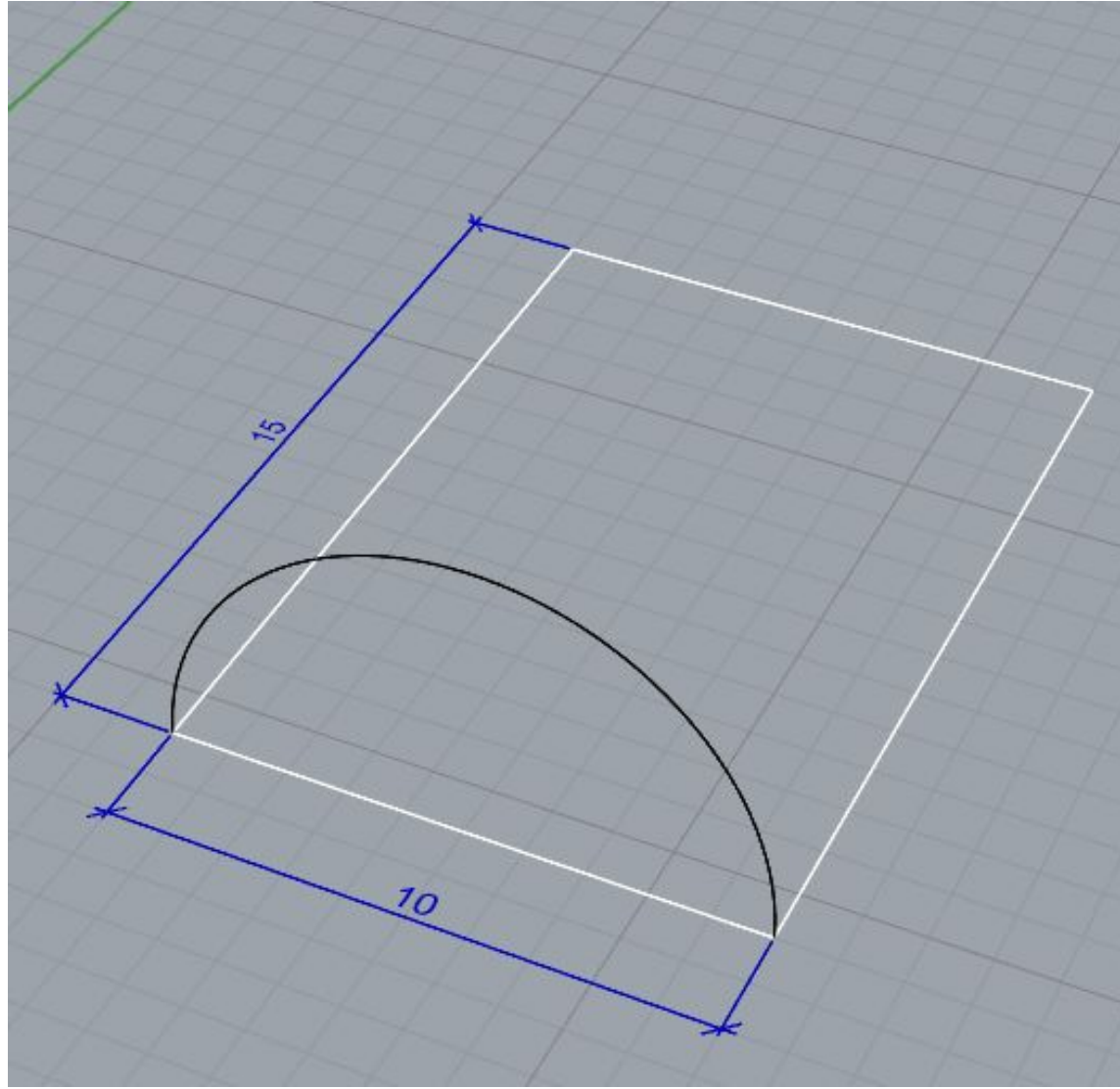
GRANROMBICUBOCTAEDRO

- através do cuboctaedro, fazer circunferências nos seus vértices com $\frac{1}{3}$ da medida



ARCOS E ABÓBADAS

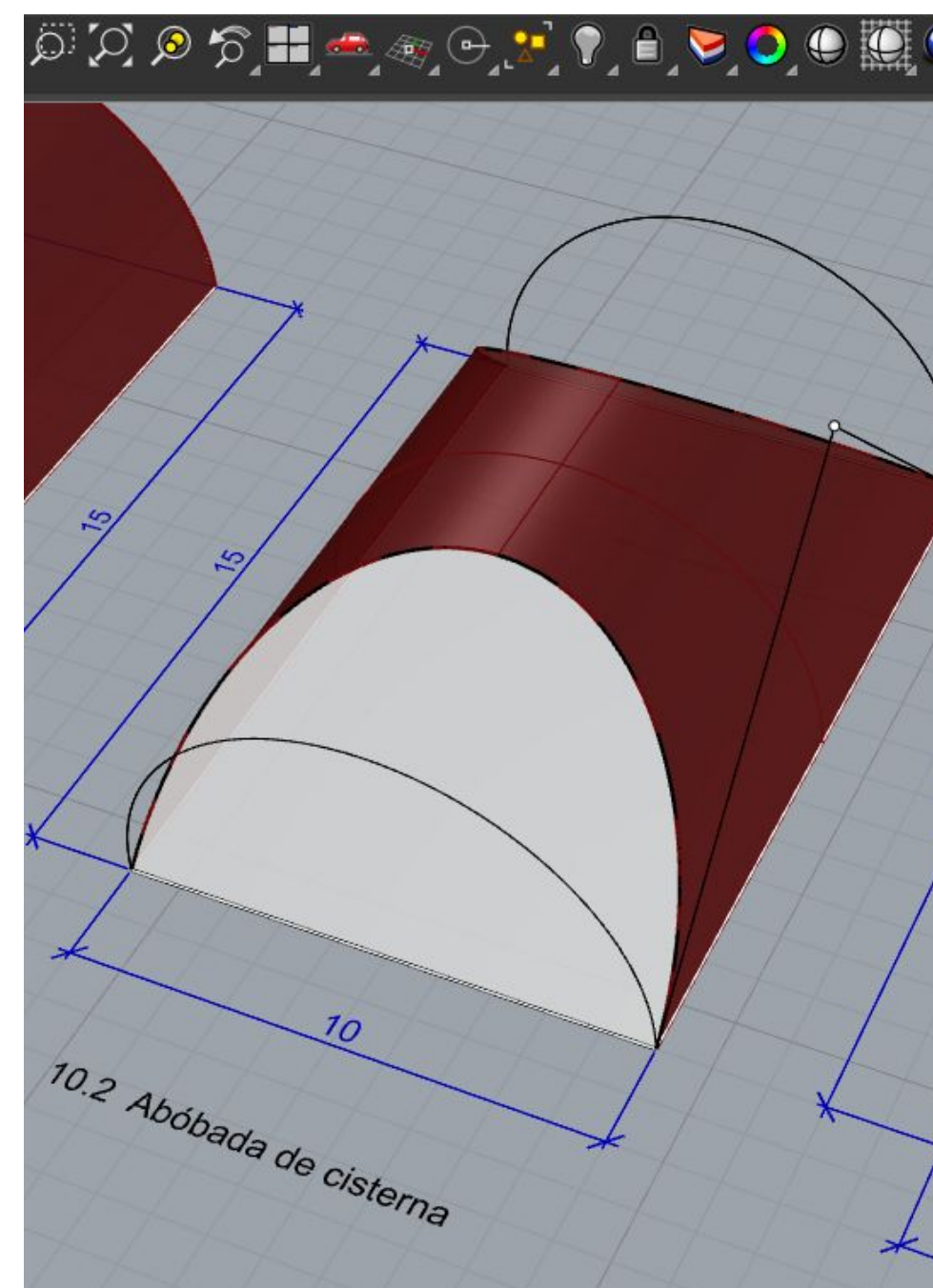
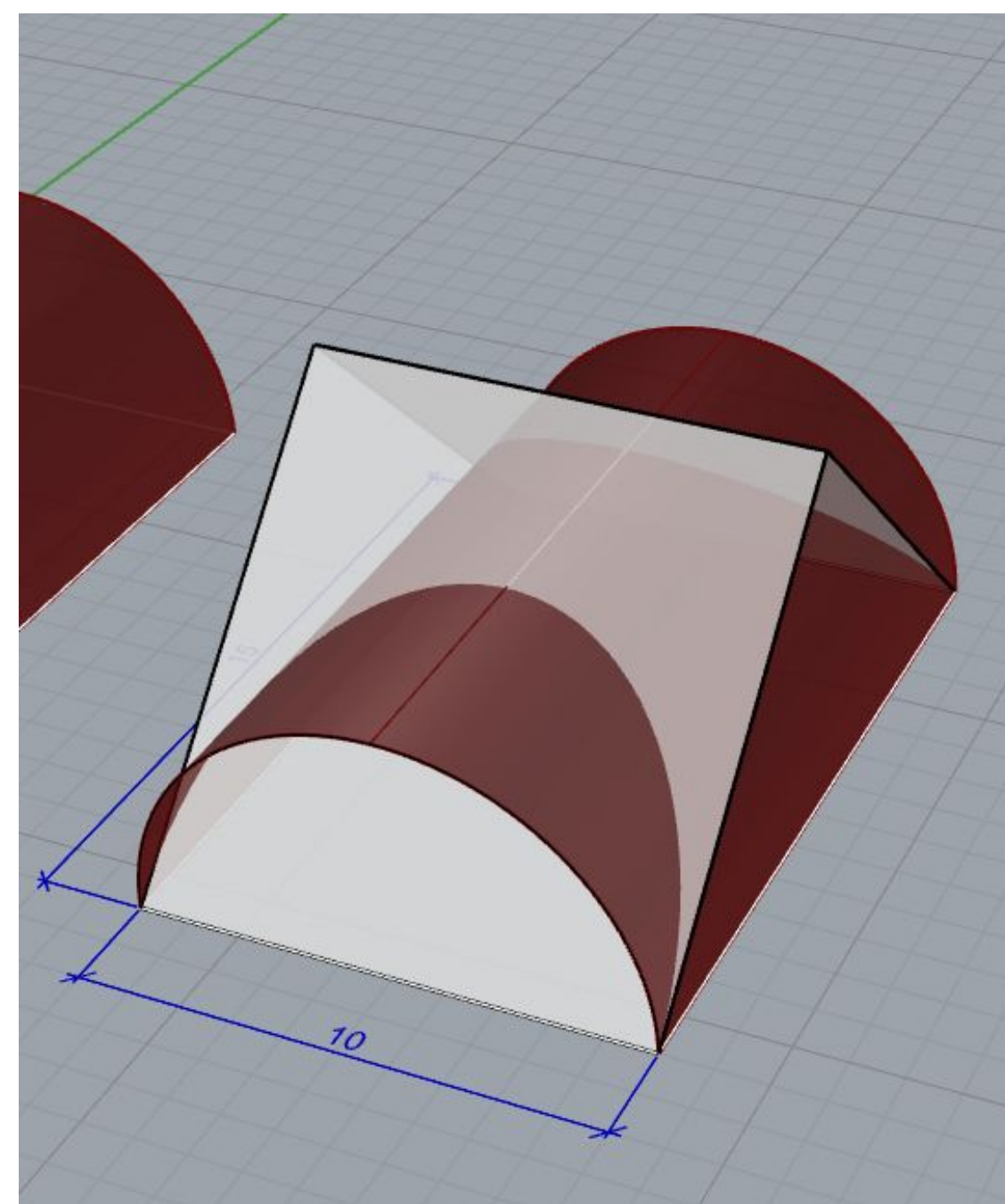
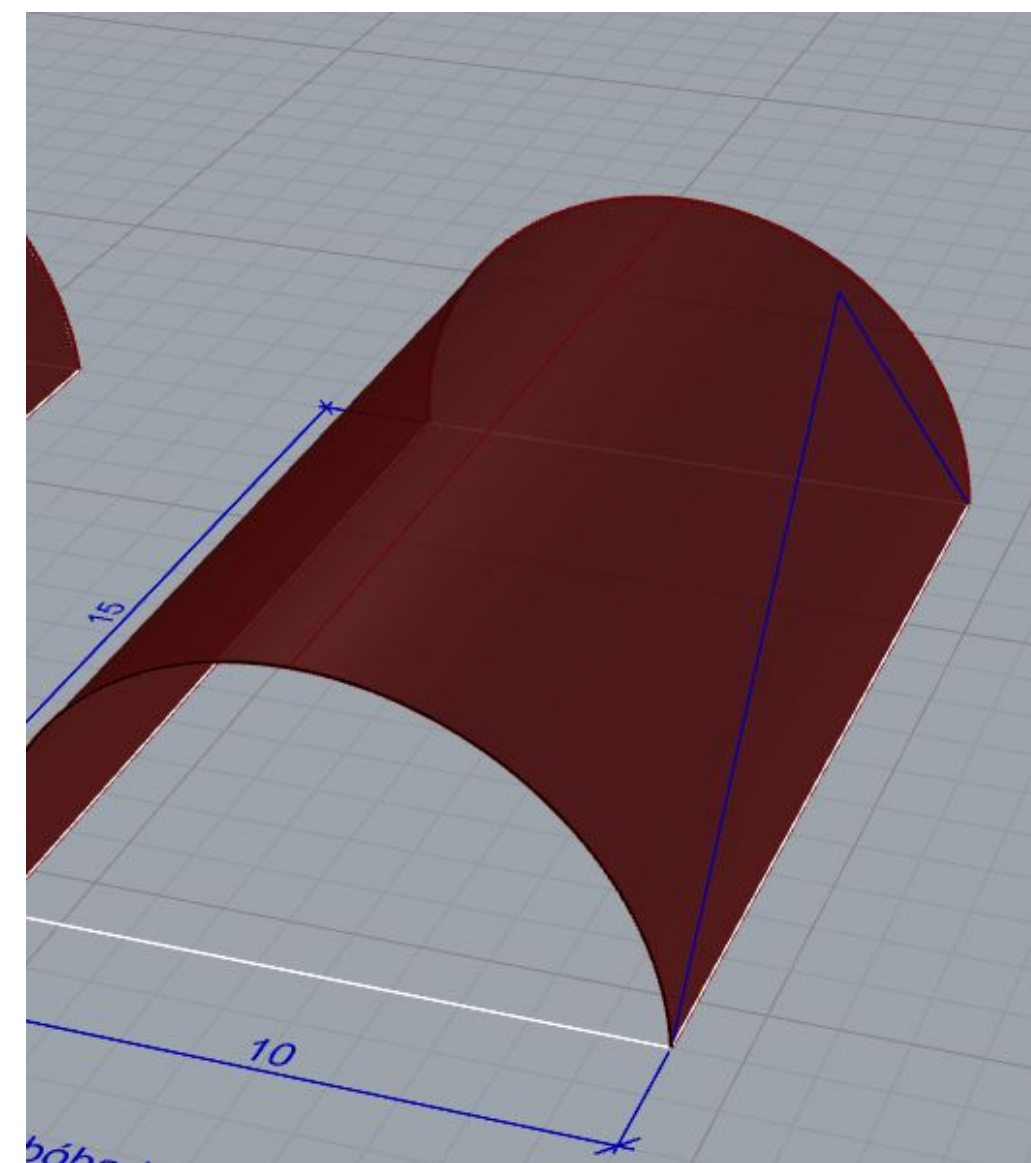
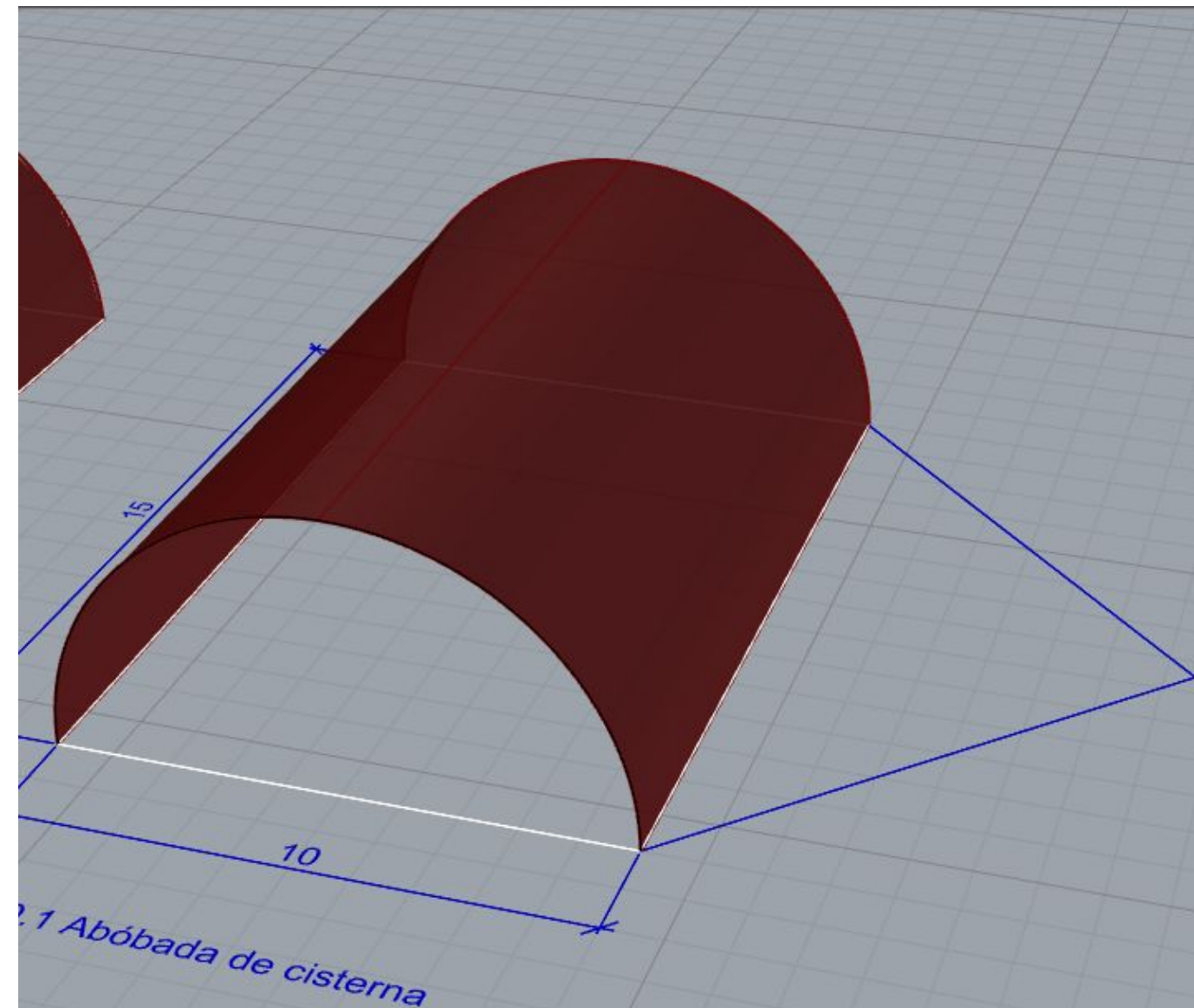
Abóbada de berço



ARCOS E ABÓBADAS

- small object - meters
- fazer um retângulo com @10,15
- DIM, para meter as cotas
- fazer uma arco, na circunferência, vertical, com centro no centro da aresta (10) do retângulo.
- selecionar o retângulo, trim,
- selecionara a parte de baixo do circulo
- extrude, selecionar o arco e puxar até ao fim do retângulo

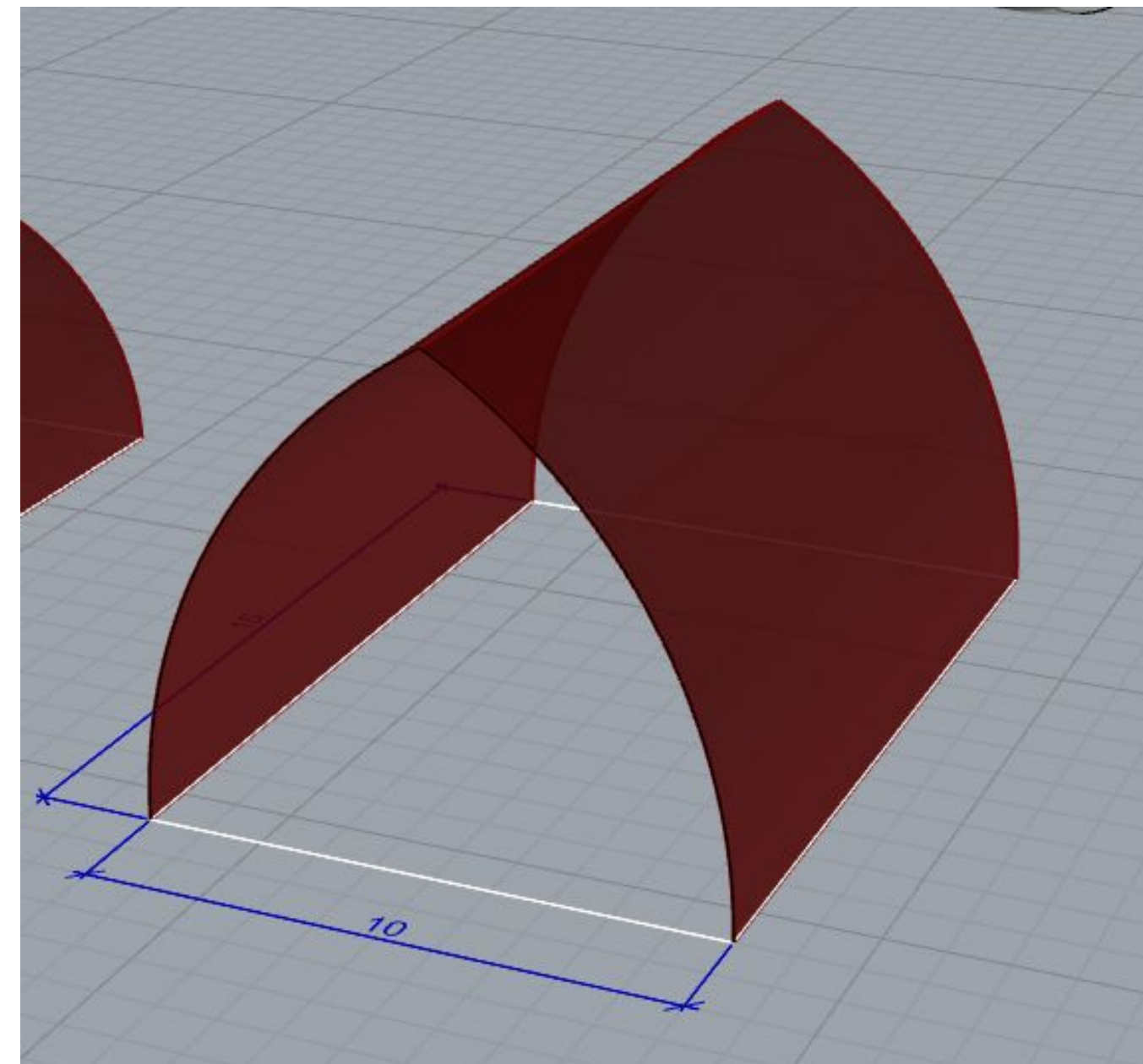
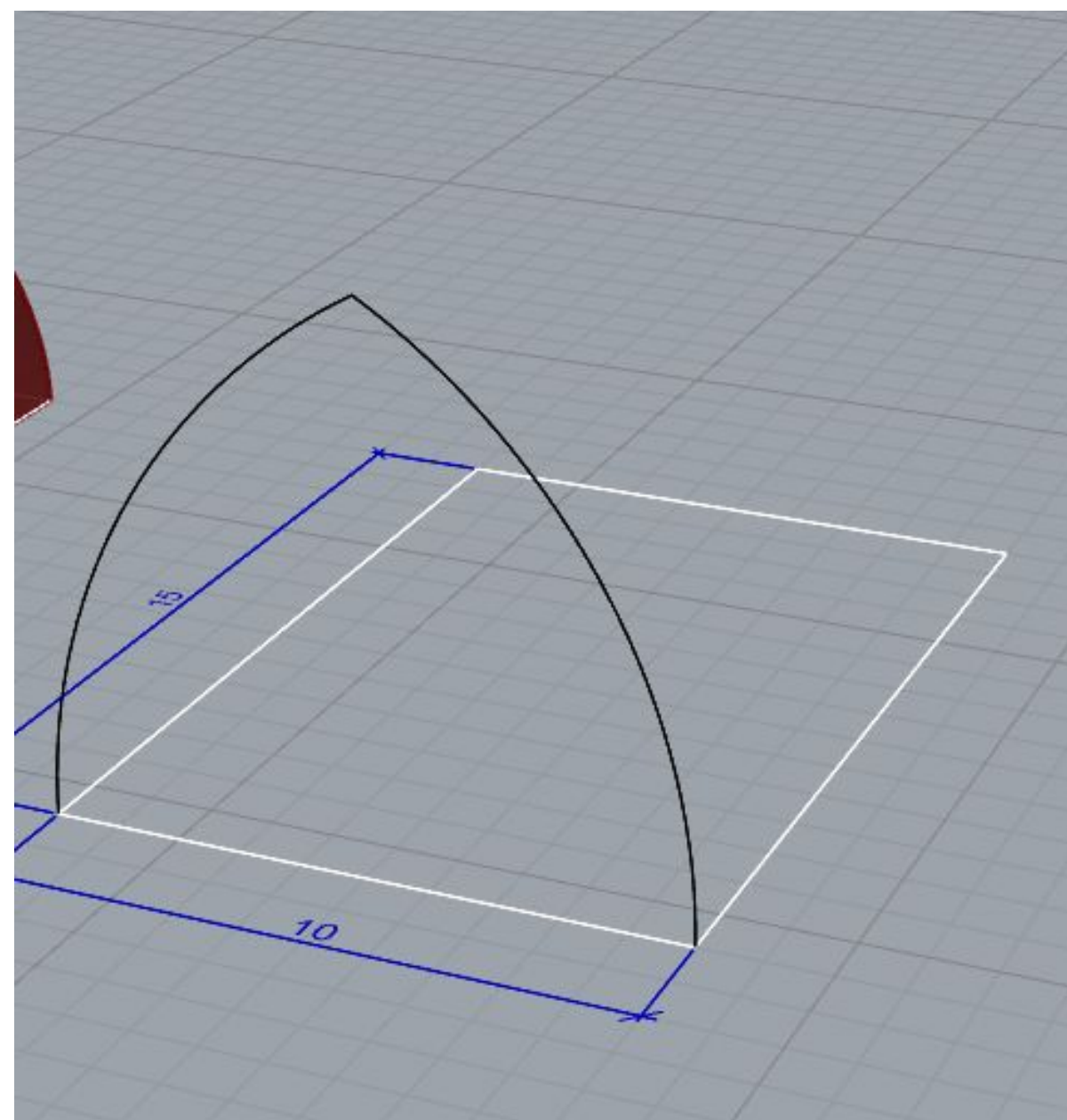
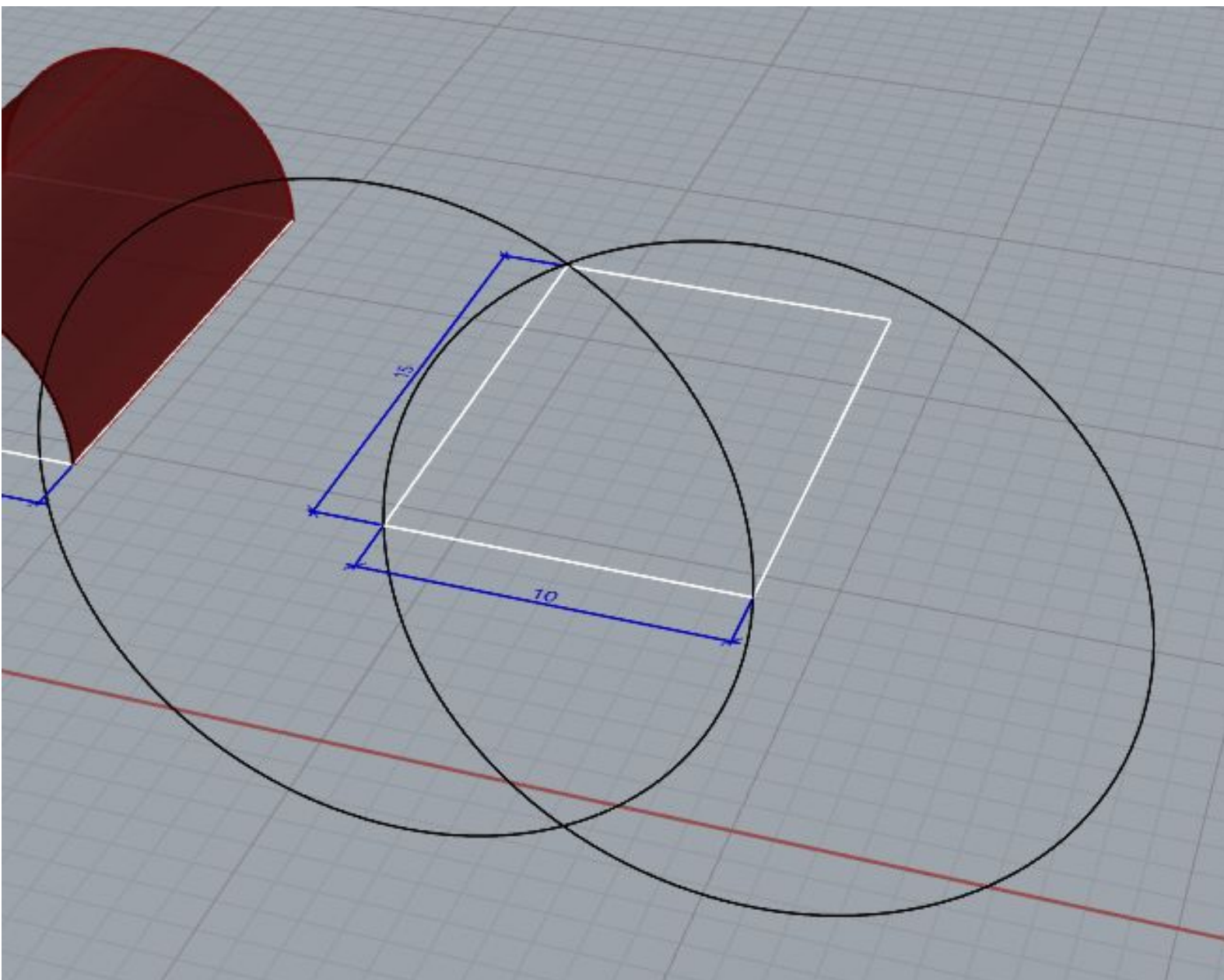
Abóbada de cisterna



ABÓBADA DE CISTERNA

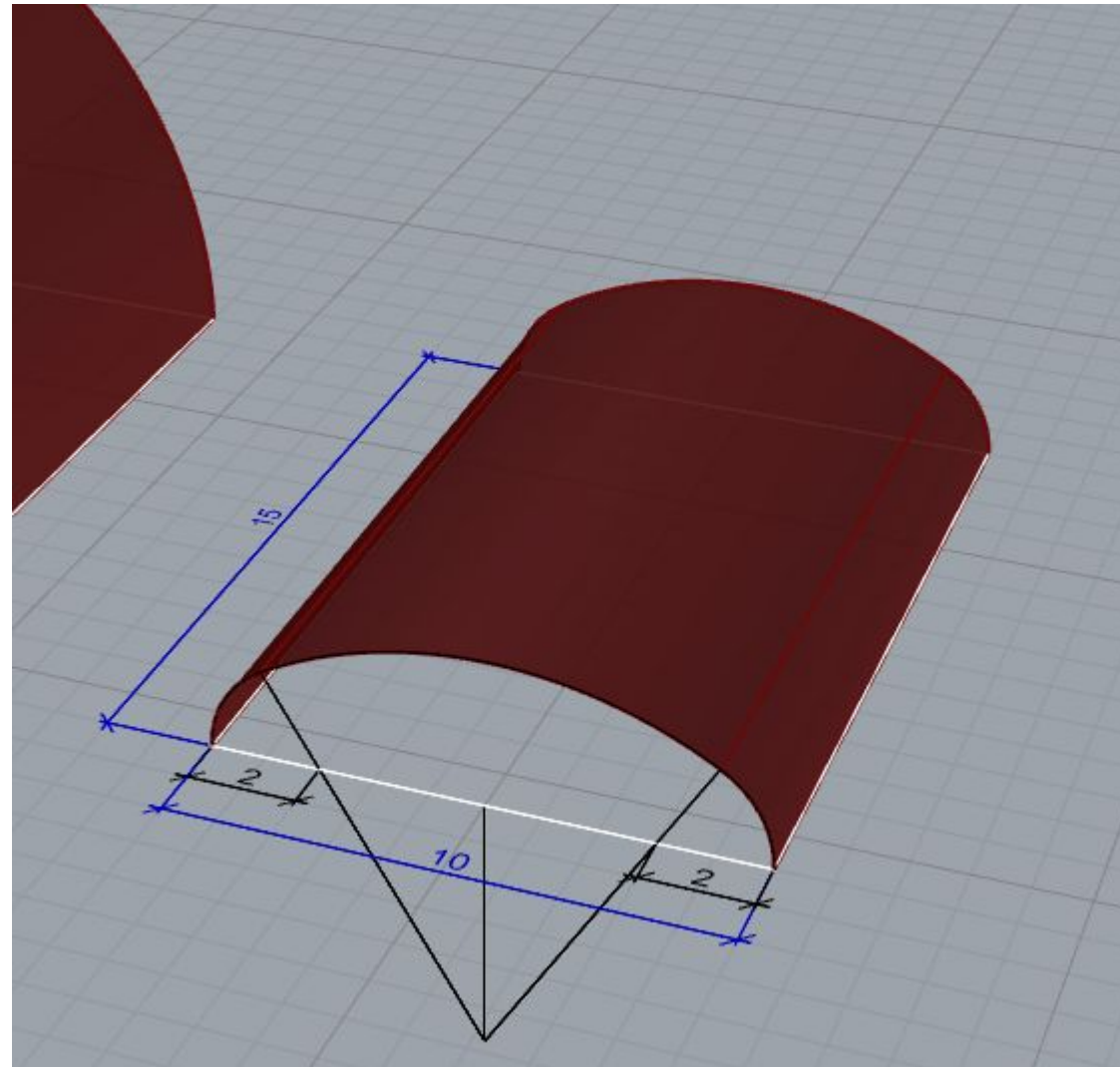
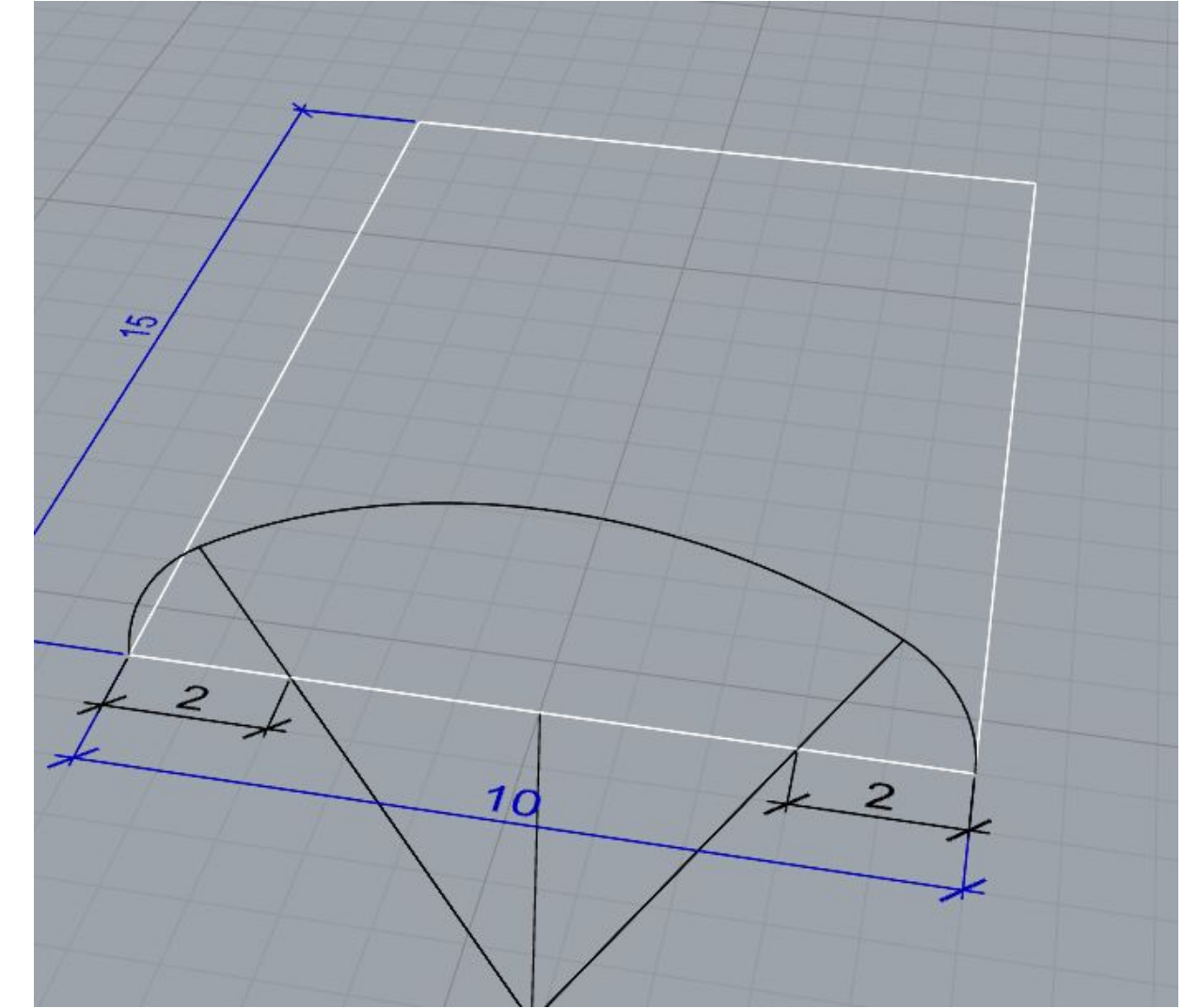
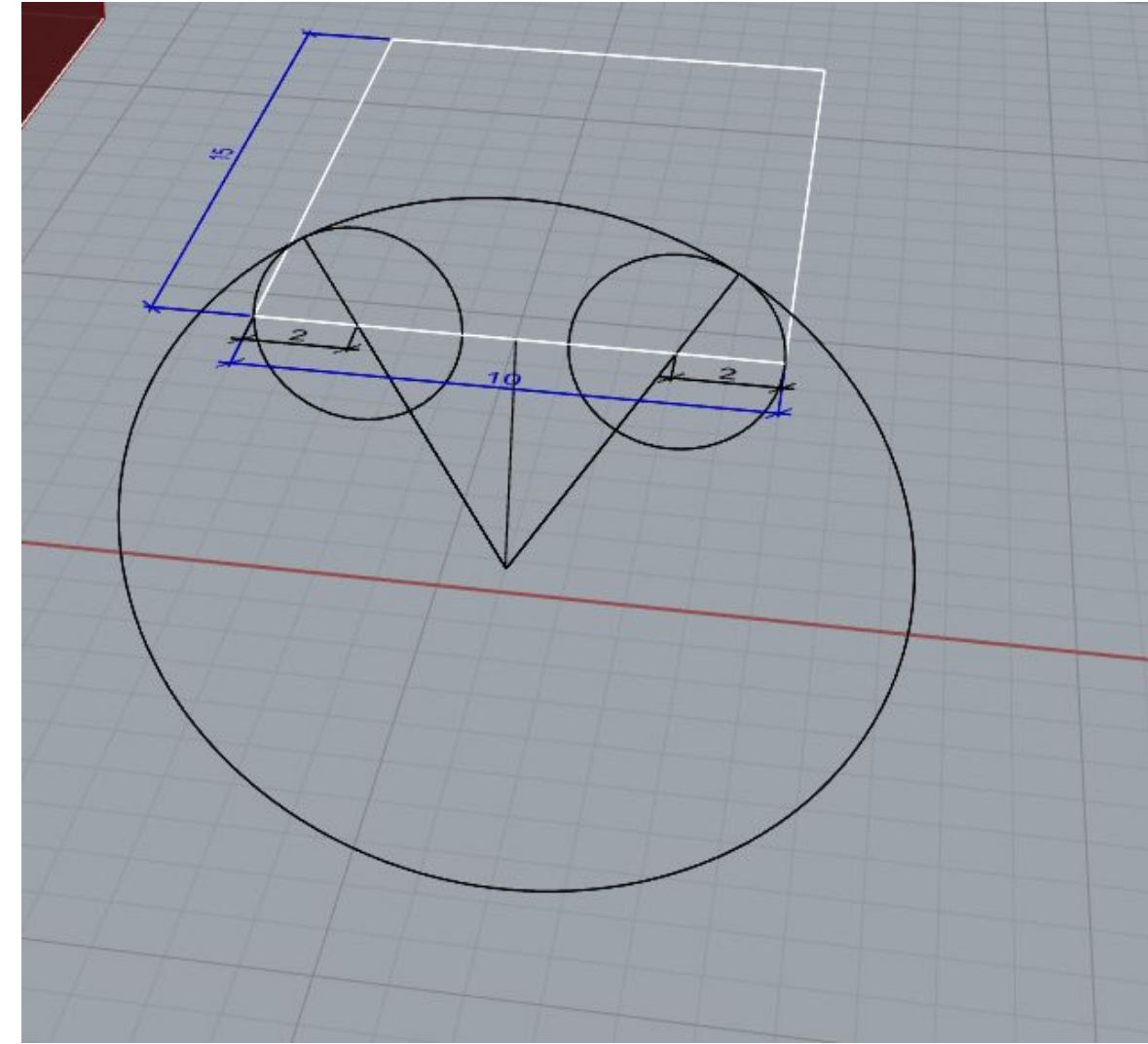
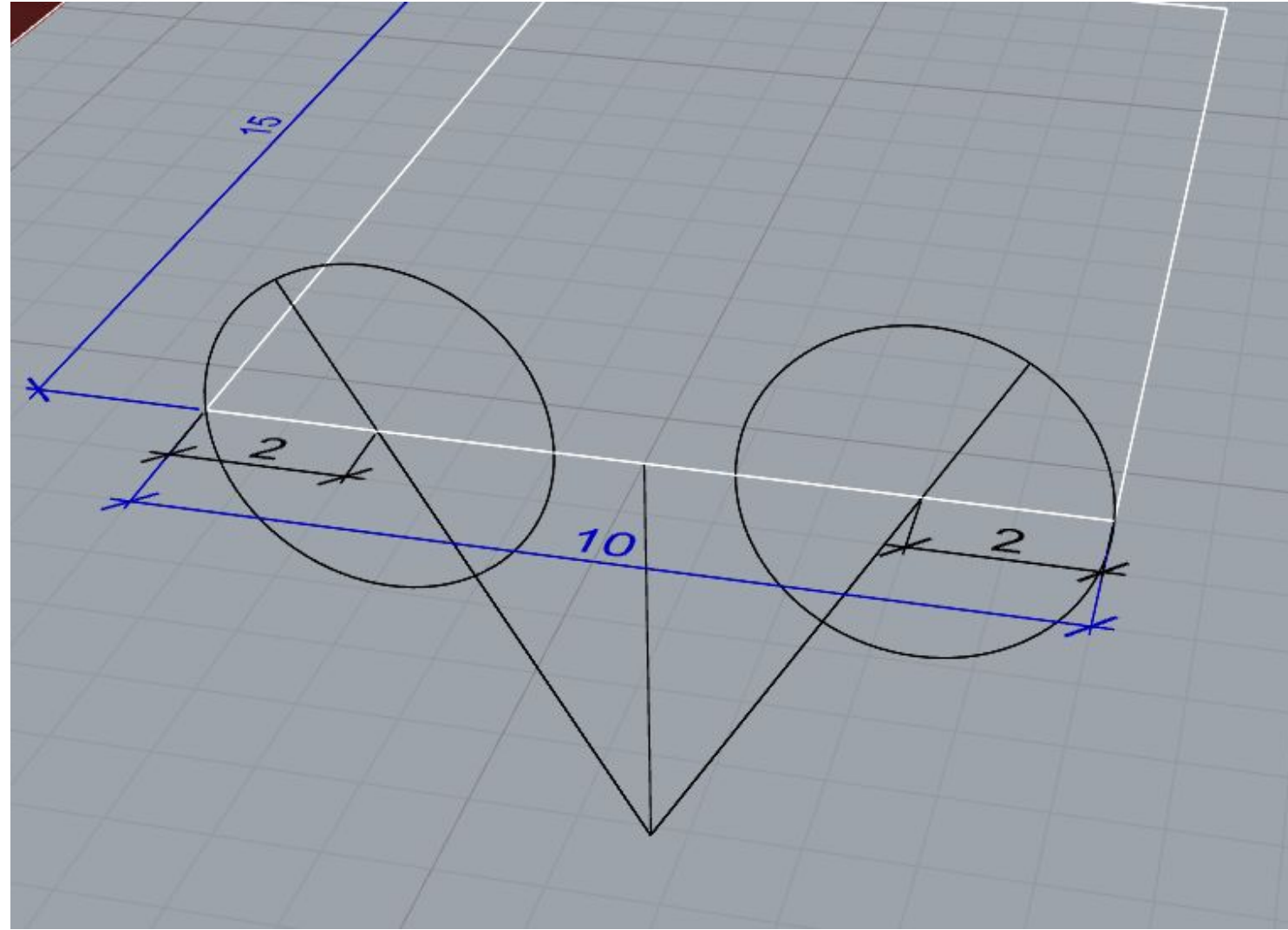
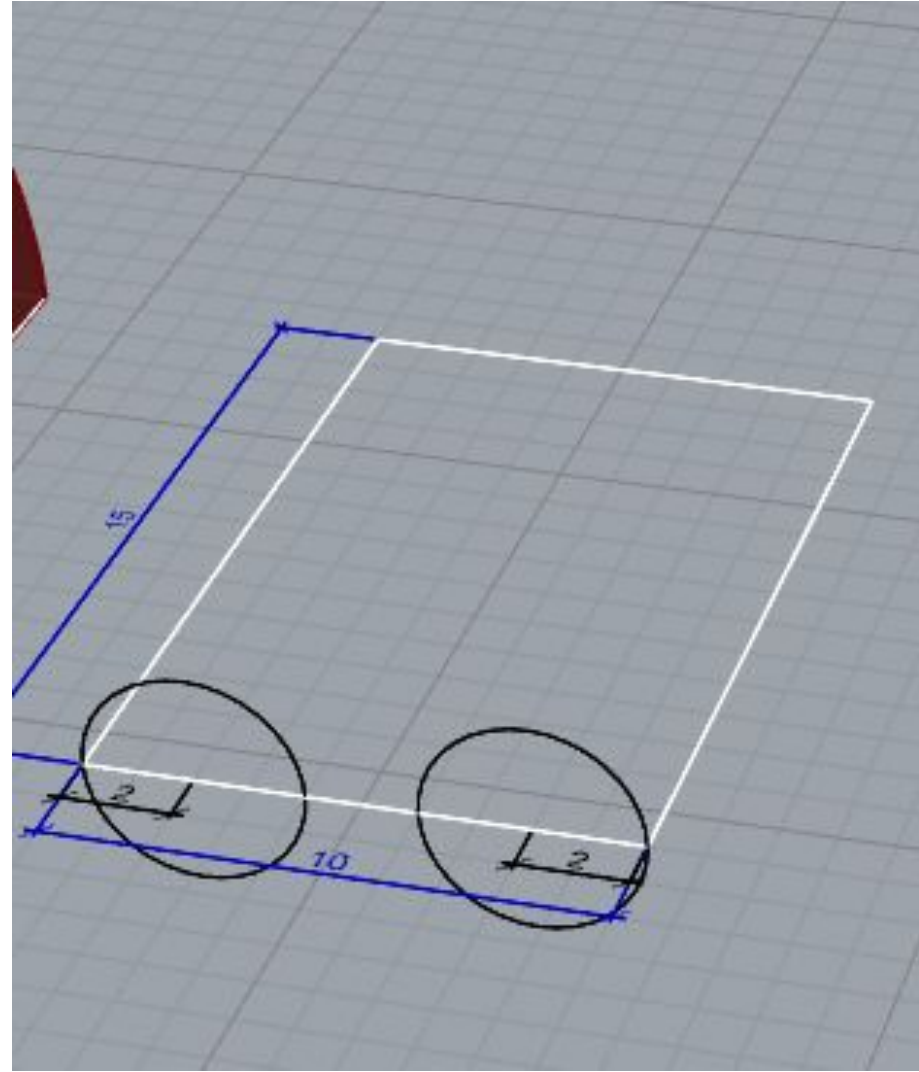
- Copy paste da última
- fazer uma line com @10<45, fazer mirror a partir do ponto médio, elas não se vão cruzar, Comando "Fillet", raio=0 e carregar no "extendOtherCurvesBy=Line", selecionar as duas linhas e elas vão se unir
- rotate3d, selecionar as duas linhas, enter, selecionar as de uma ponta à outra a lateral da abóbada, angulo na horizontal, e depois para cima
- extrudecvr, puxar o triângulo até à outra ponta
- layer arco, comando curve, curve from objects, intersection, selecionar a interseção e a abóbada
- trim

Abóbada ogival



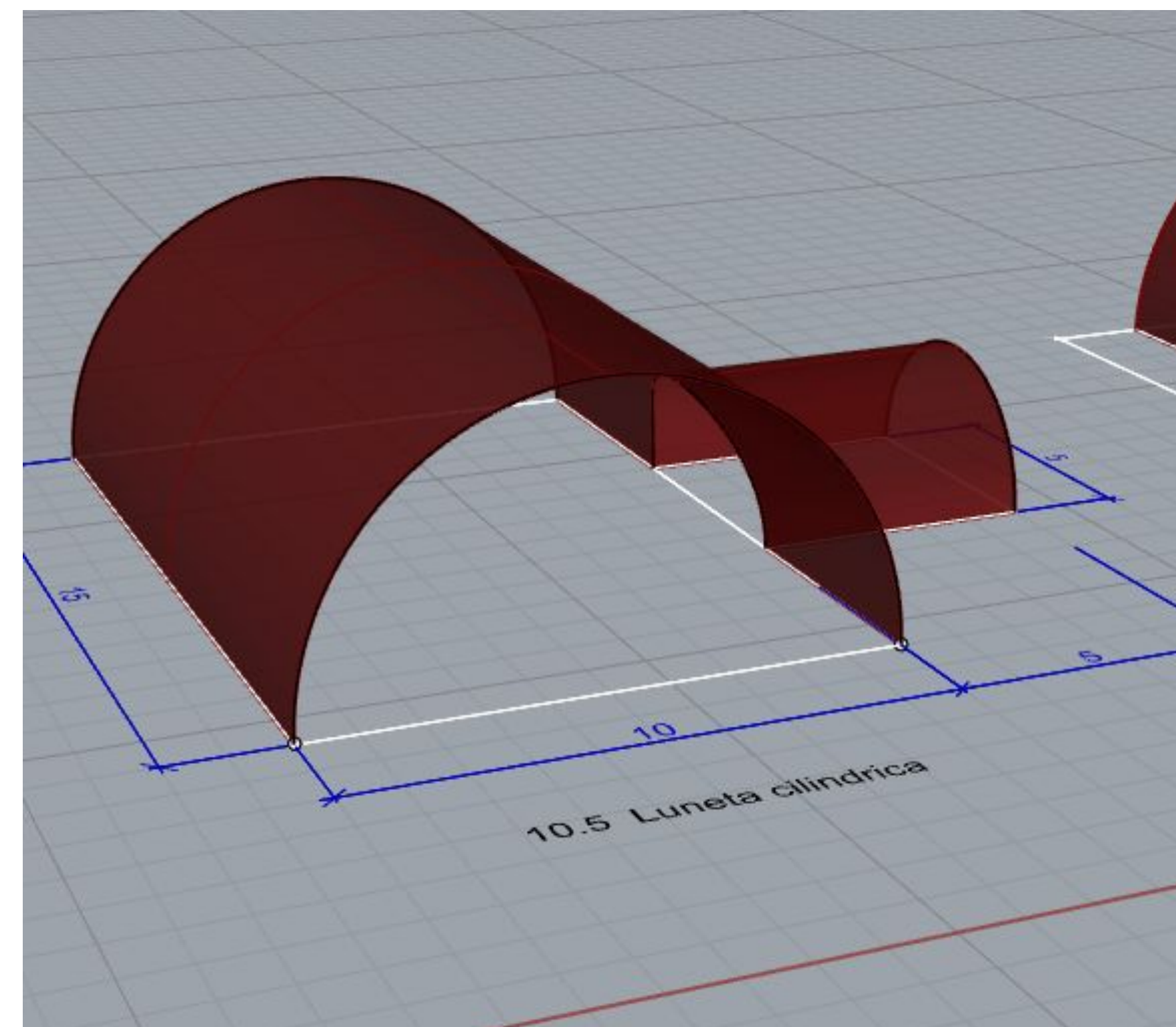
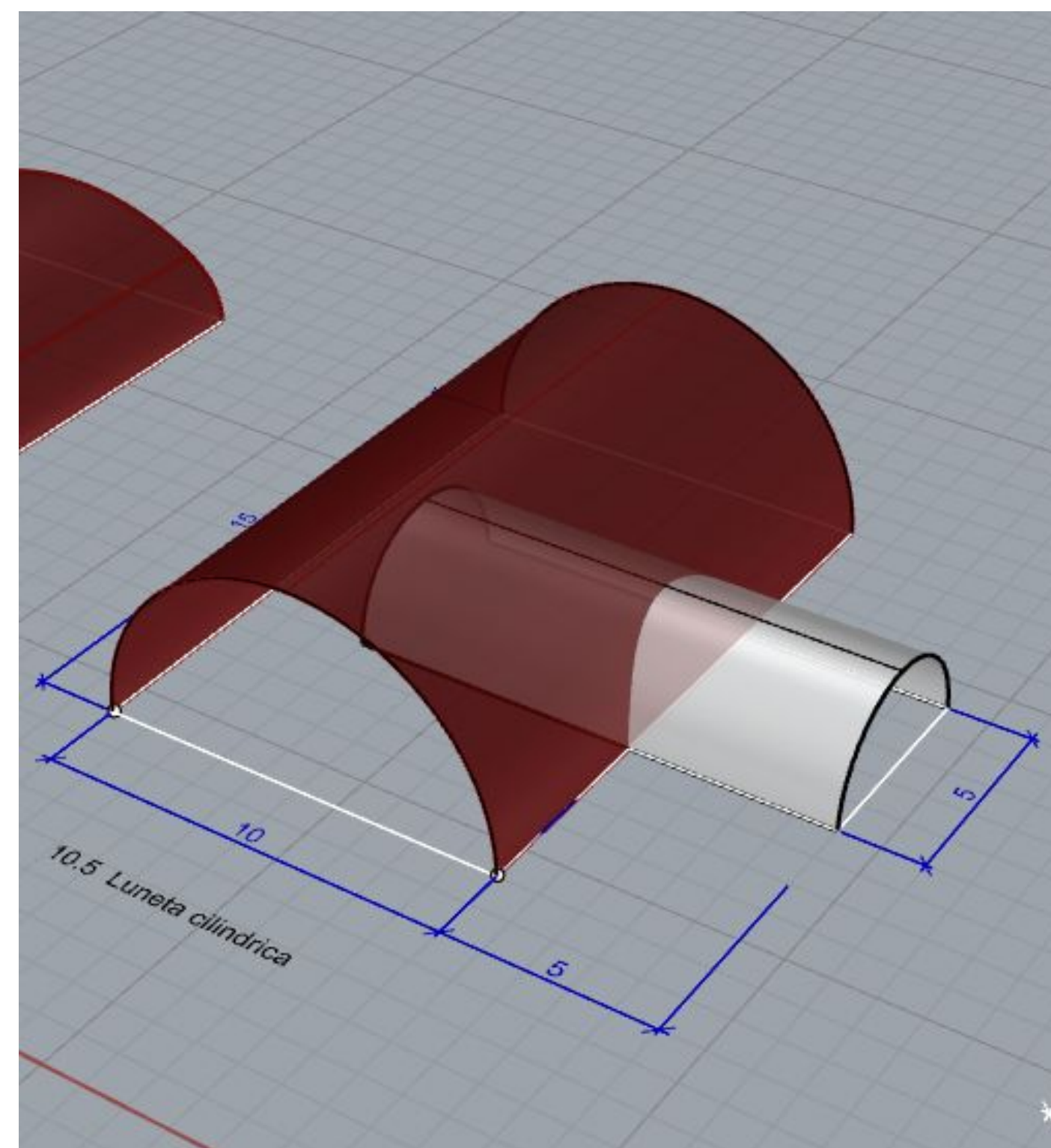
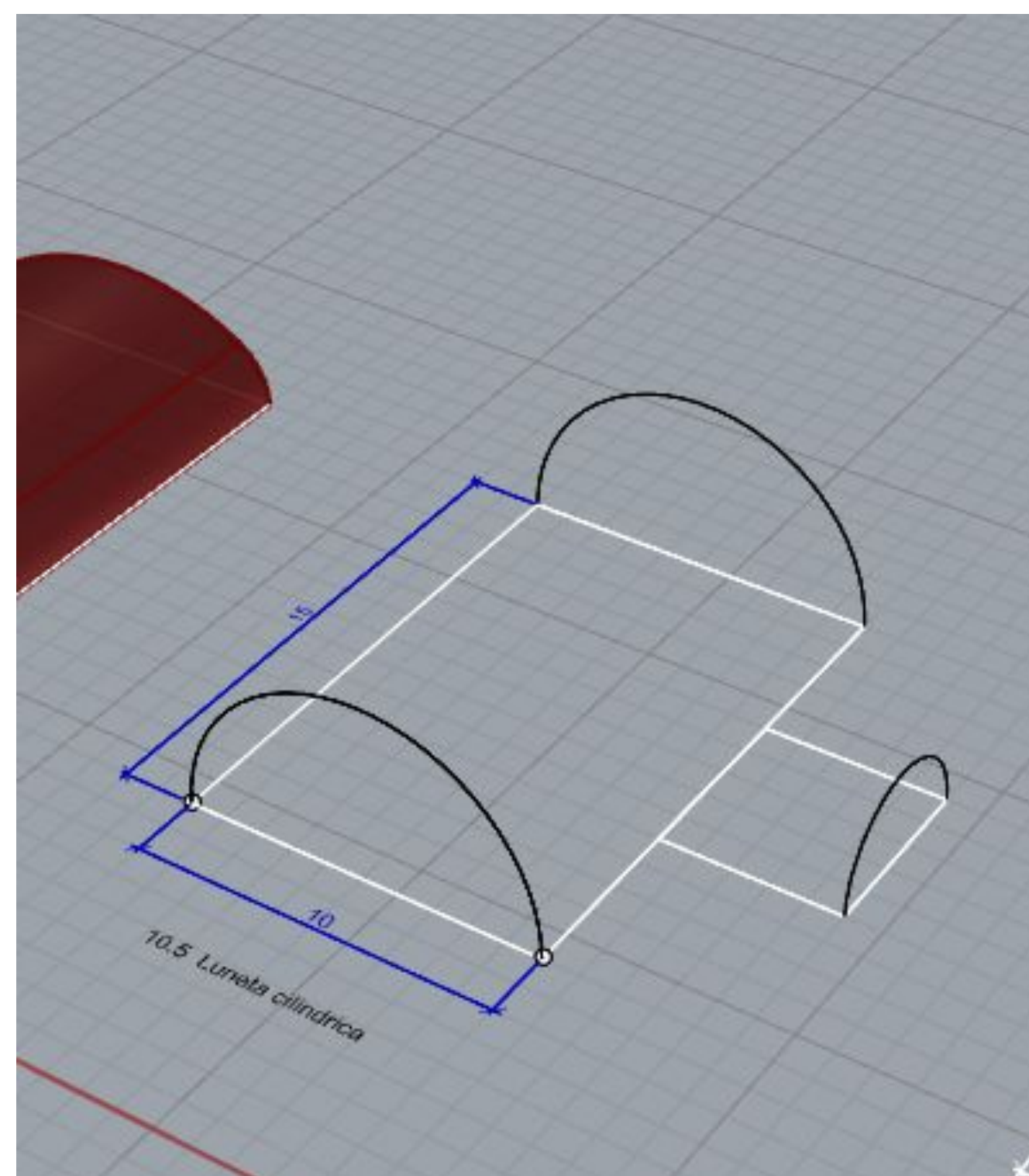
- copy paste, sem a aparte da abobada,
- 2 circunferências verticais na face de 10
- trim até ficar apenas o arco
- extrude

Abóbada abatida



- copy paste, sem a aparte da abobada
- fazer 2 círculos nos cantos da face 10
- dim com 2m
- fazer os dois círculos verticais com centro nos 2m
- linha vertical para baixo no midpoint face do retângulo de 10 e depois desse ponto a passar no centro do dois círculos até ao diametro
- fazer um círculo vertical com centro na ponta fa linha vertical para baixo até ao diametro dos círculos (mudar para a perspectiva frontal)
- trim de tudo so deixar o arco
- join do arco
- extrude

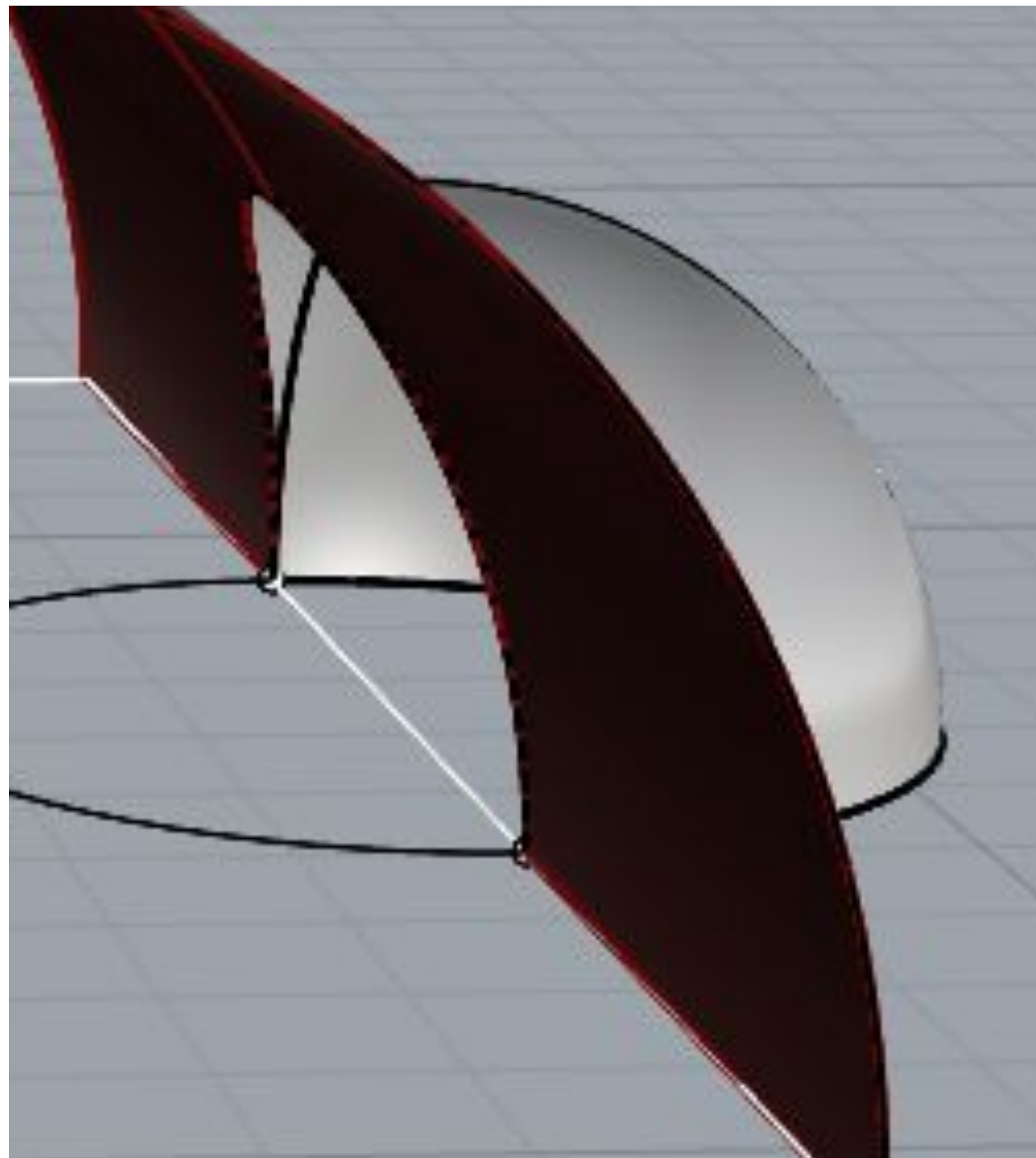
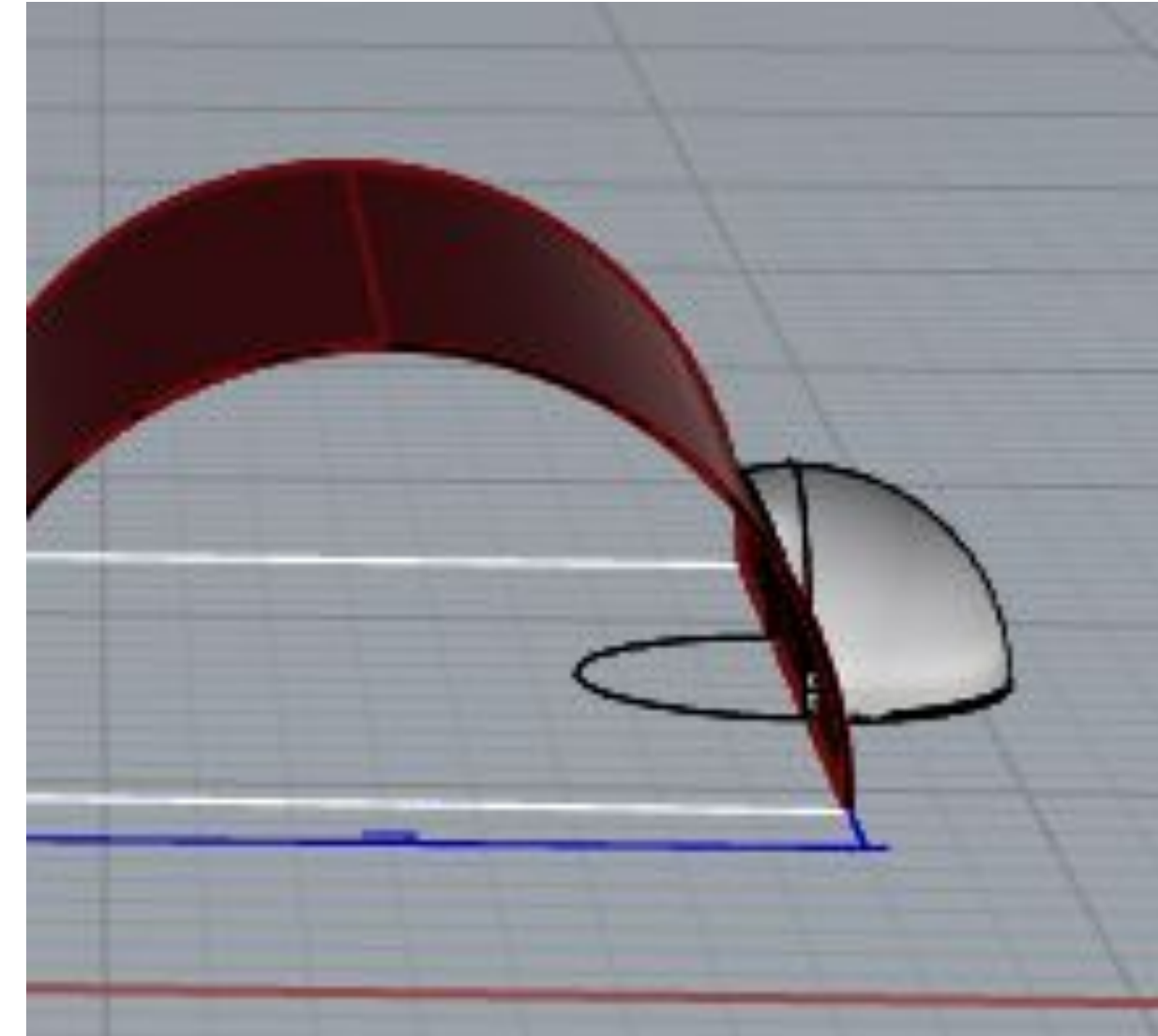
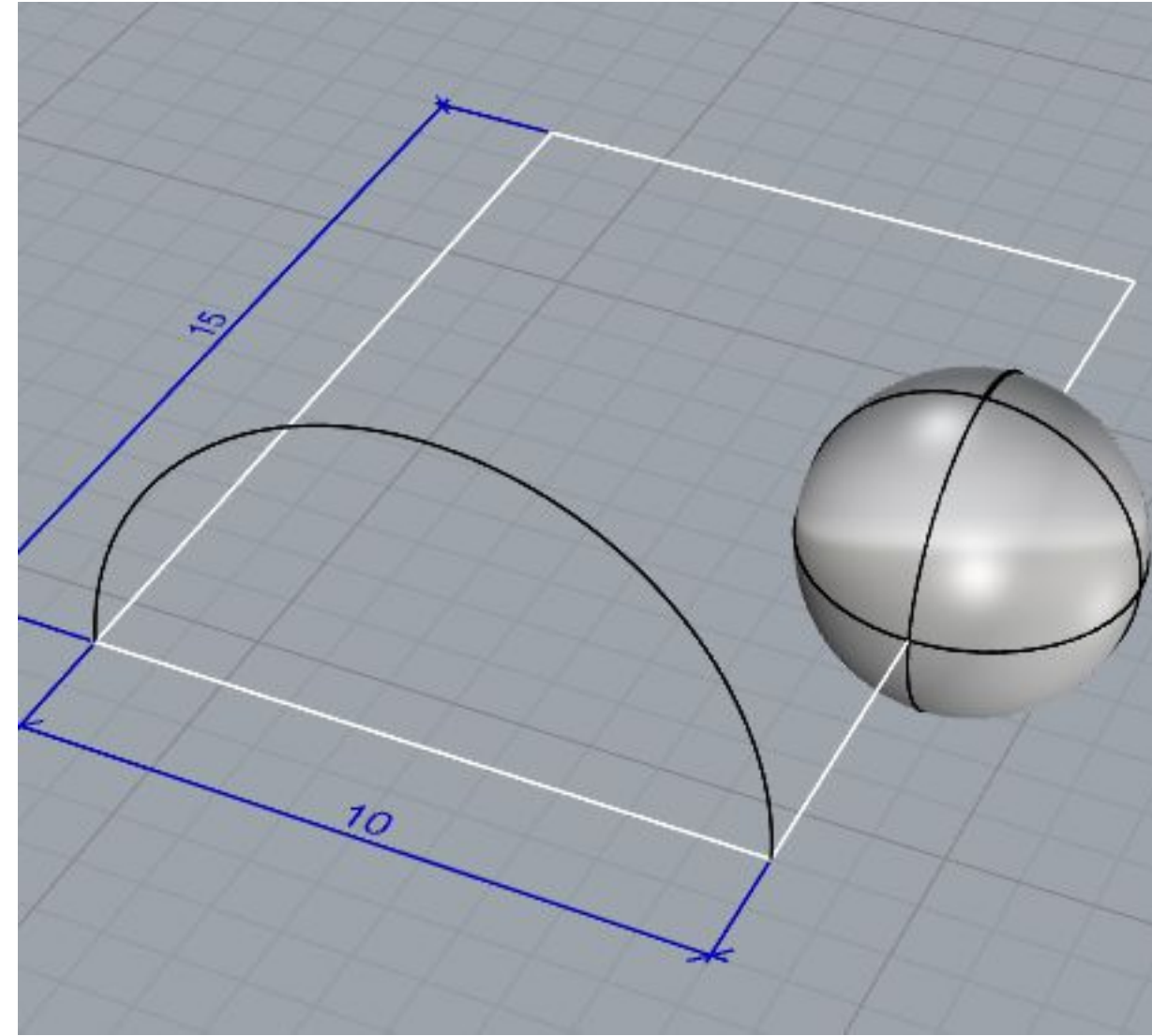
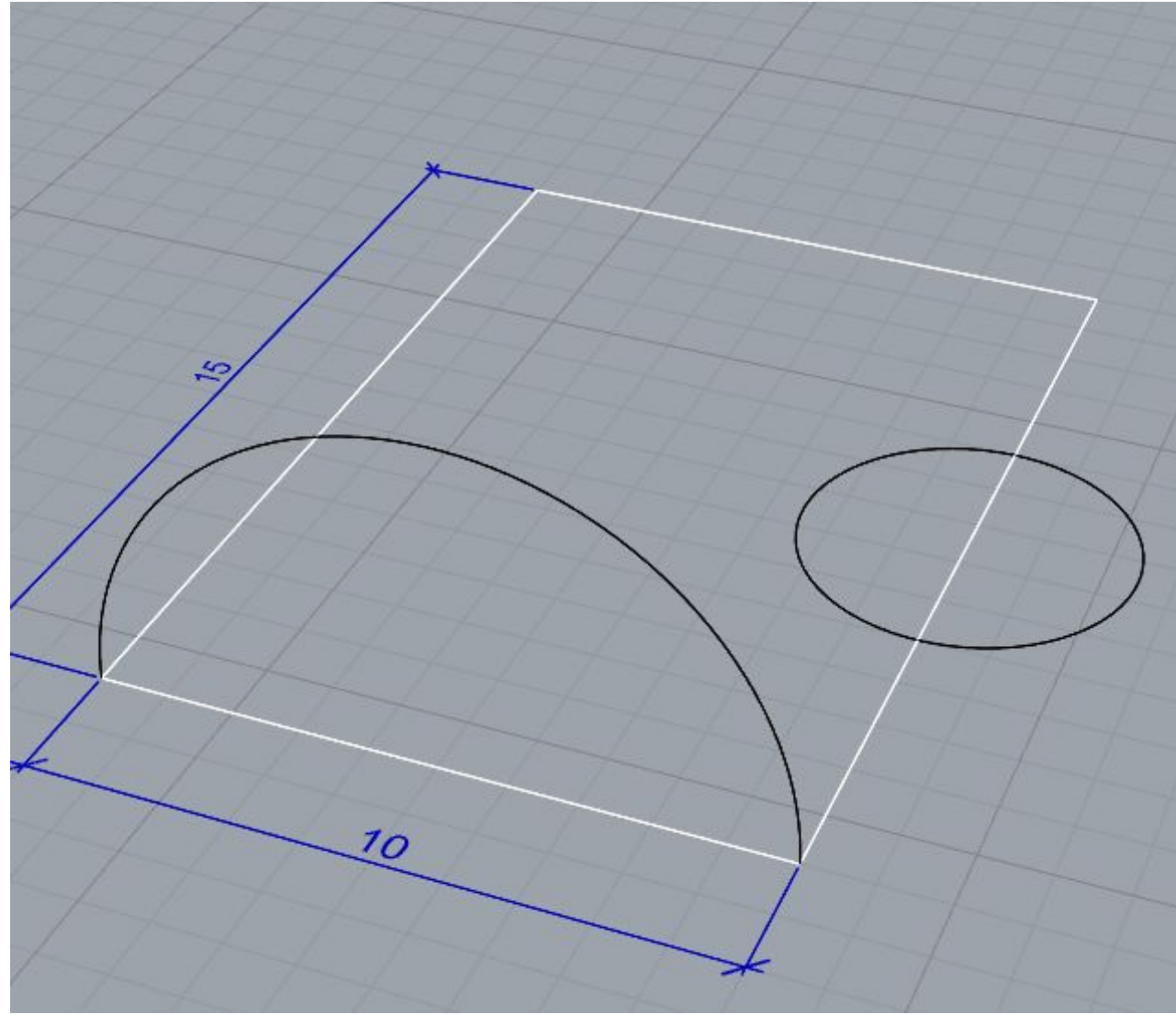
Luneta cilíndrica



LUNETE CILINDRICA

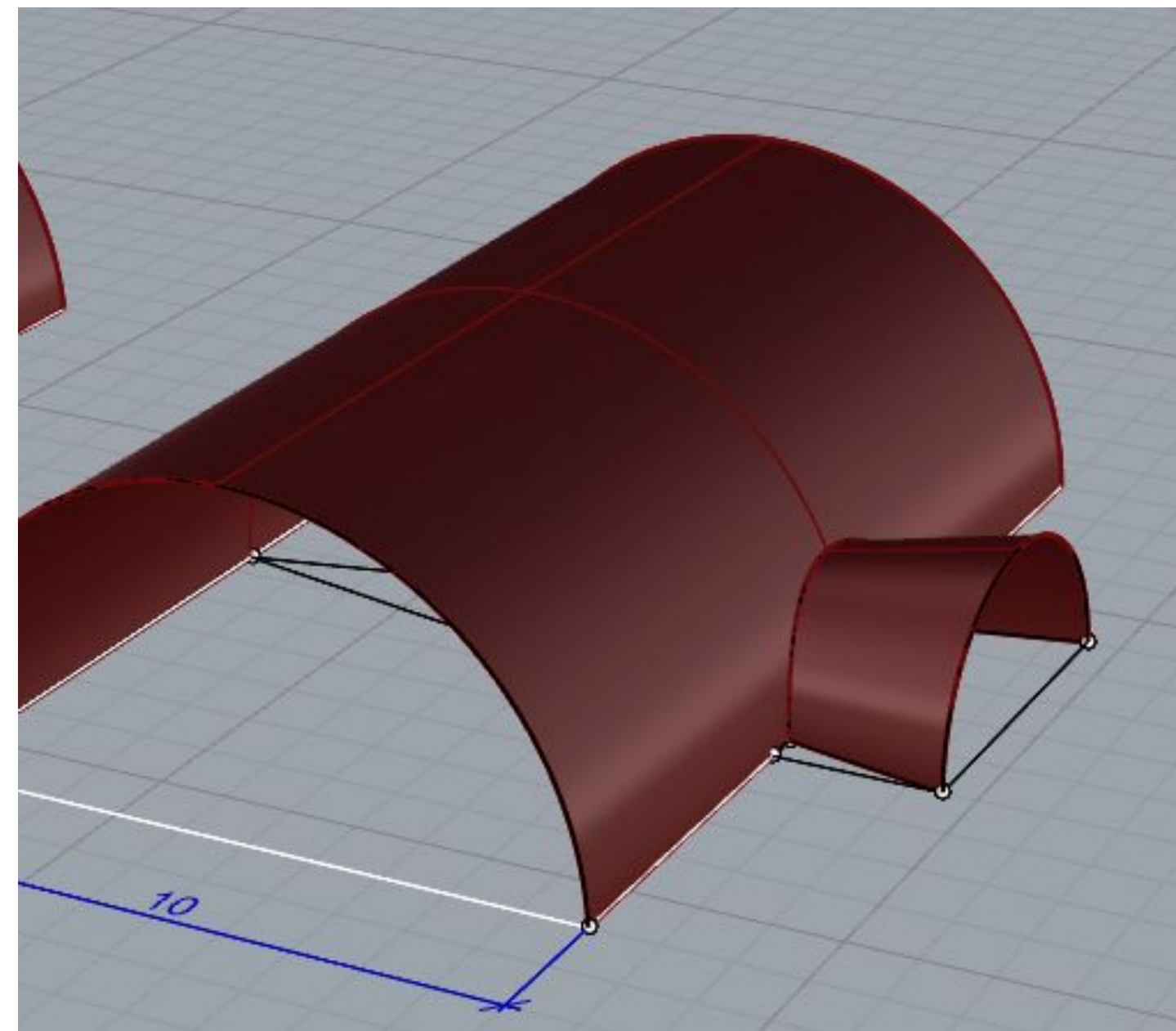
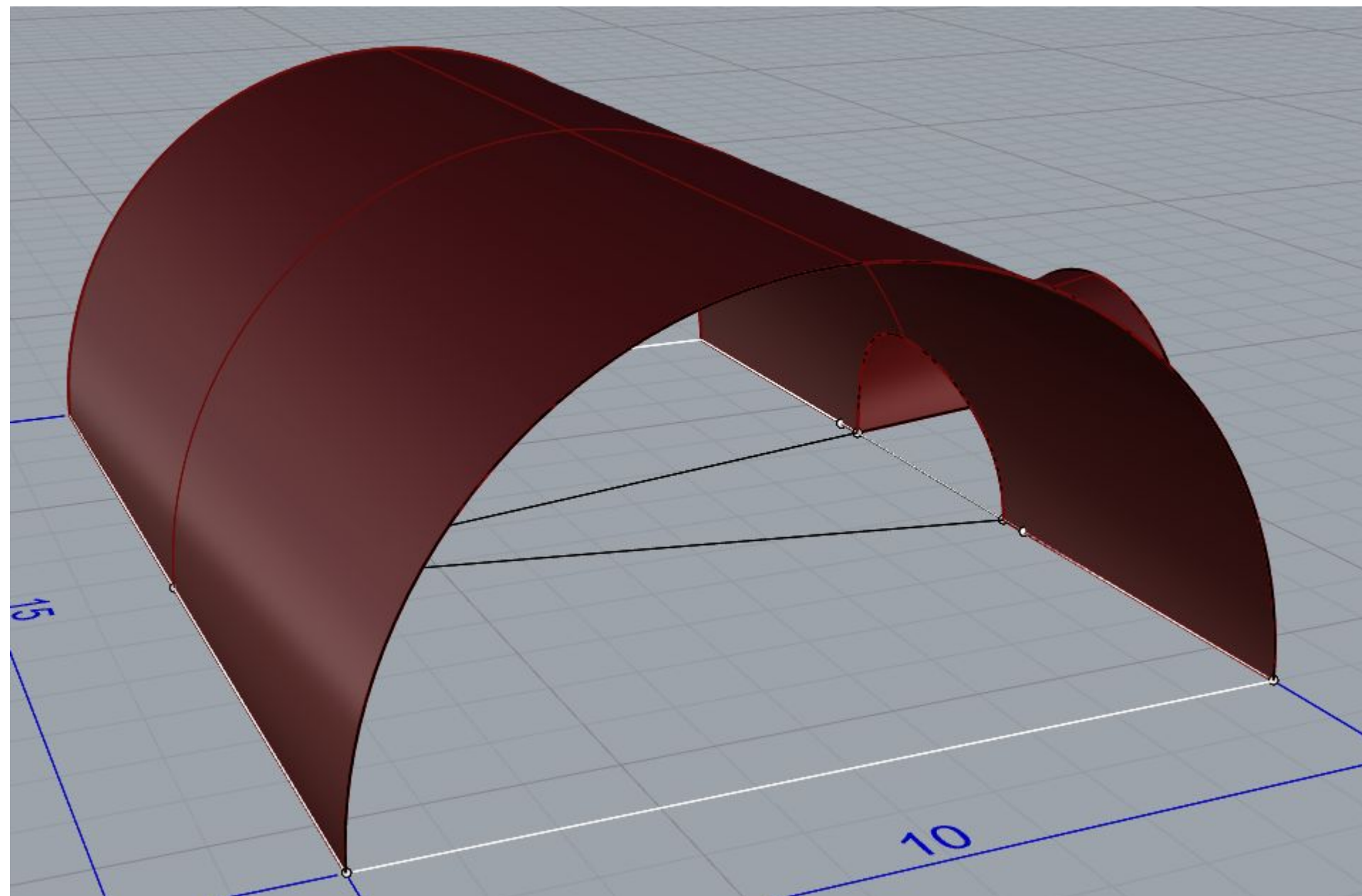
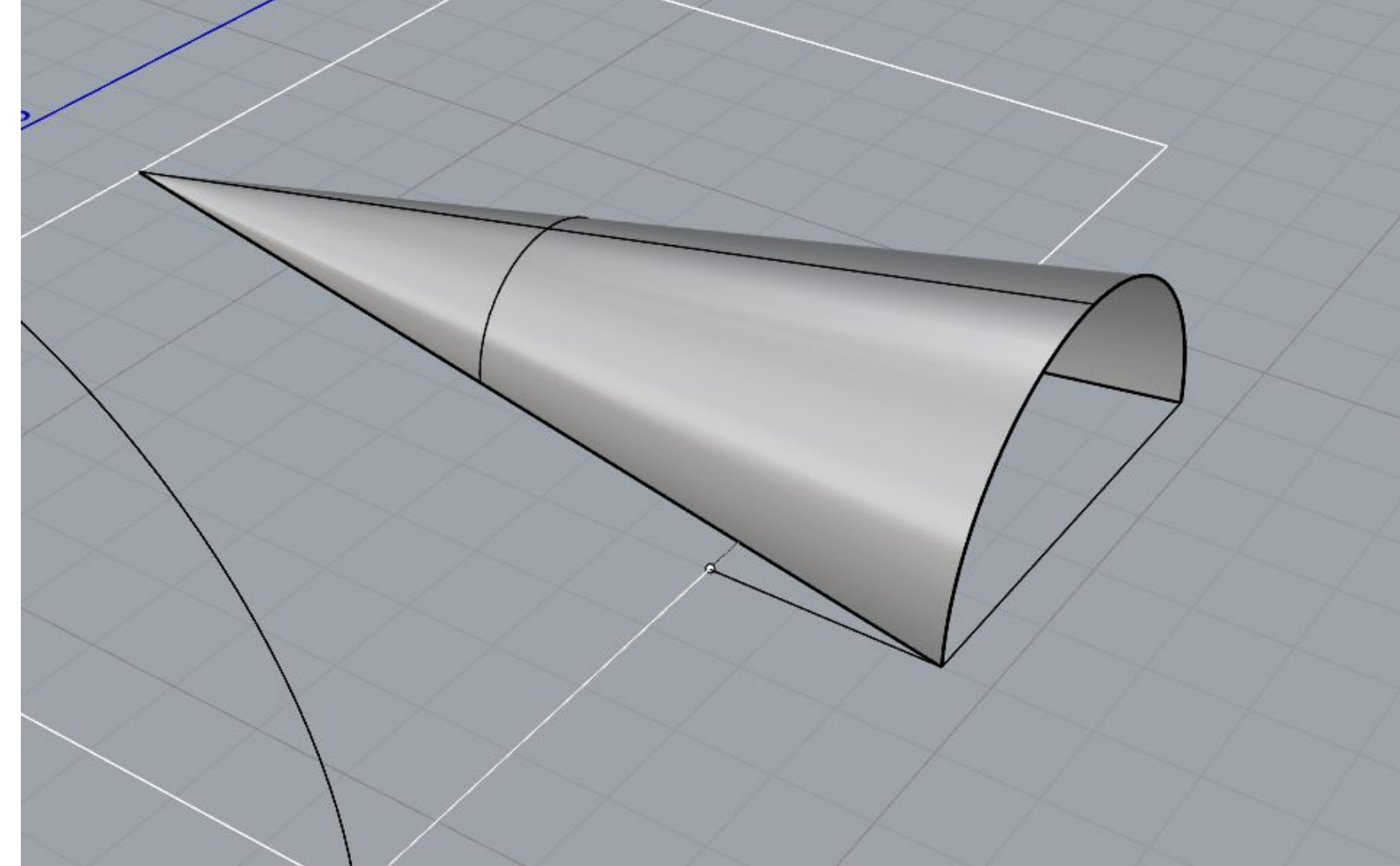
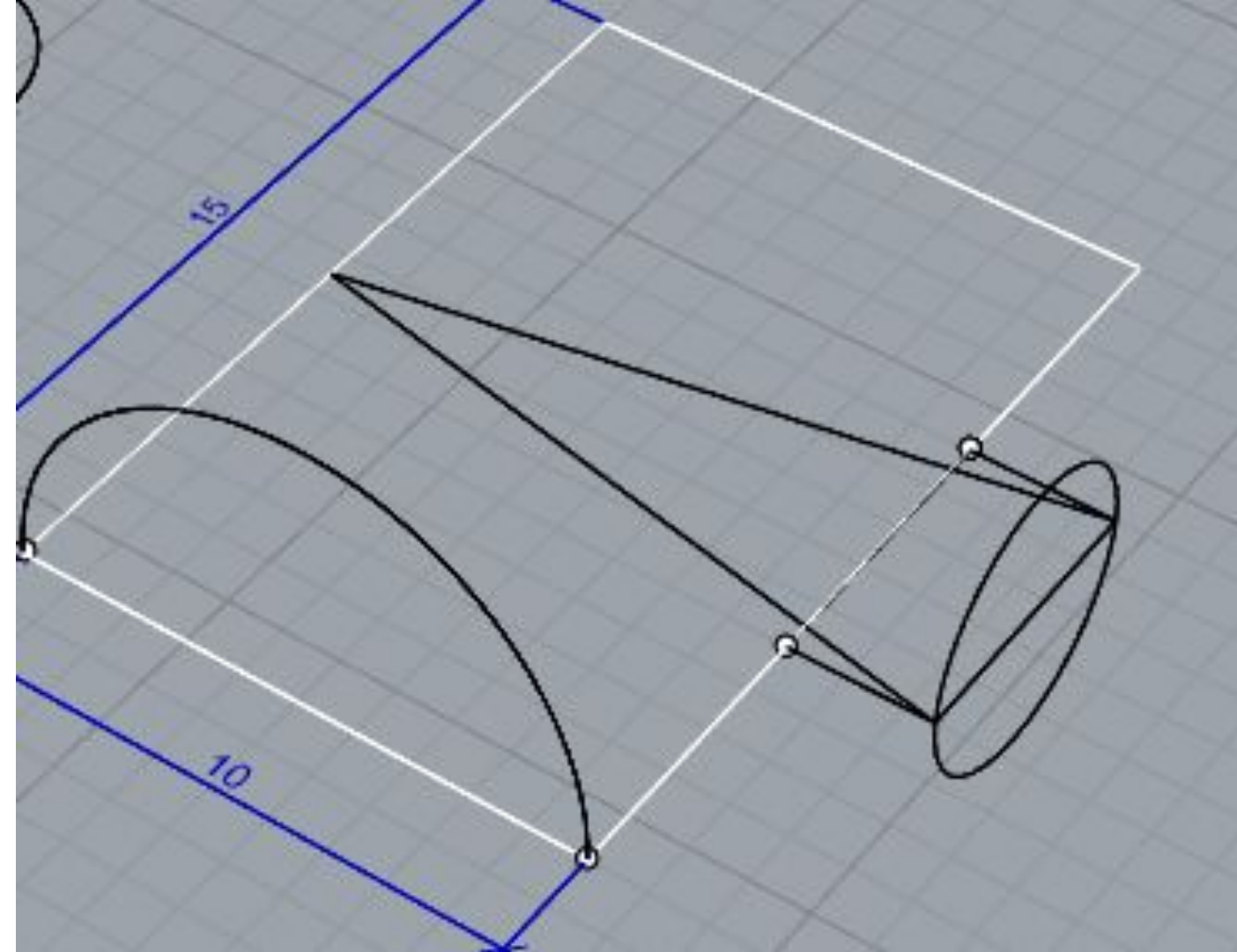
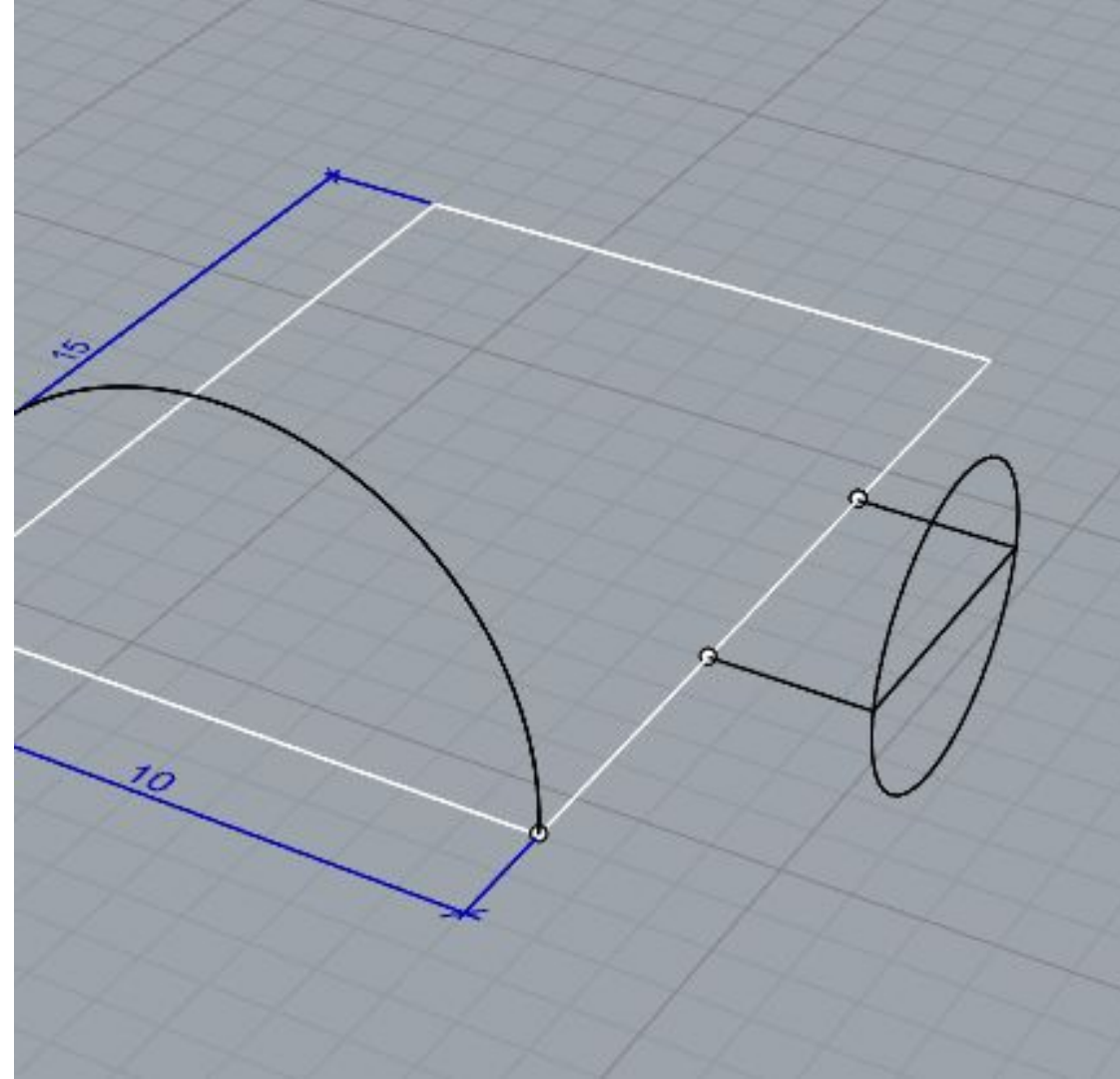
- base retangular das abóbadas
- quadrado com 5,5 com midpoint lateral na lateral da base
- circunferências na laterais, trim da parte de baixo, extrude
- curve, curve from objects, intersection, das duas abaóbadas
- trim

Luneta esférica

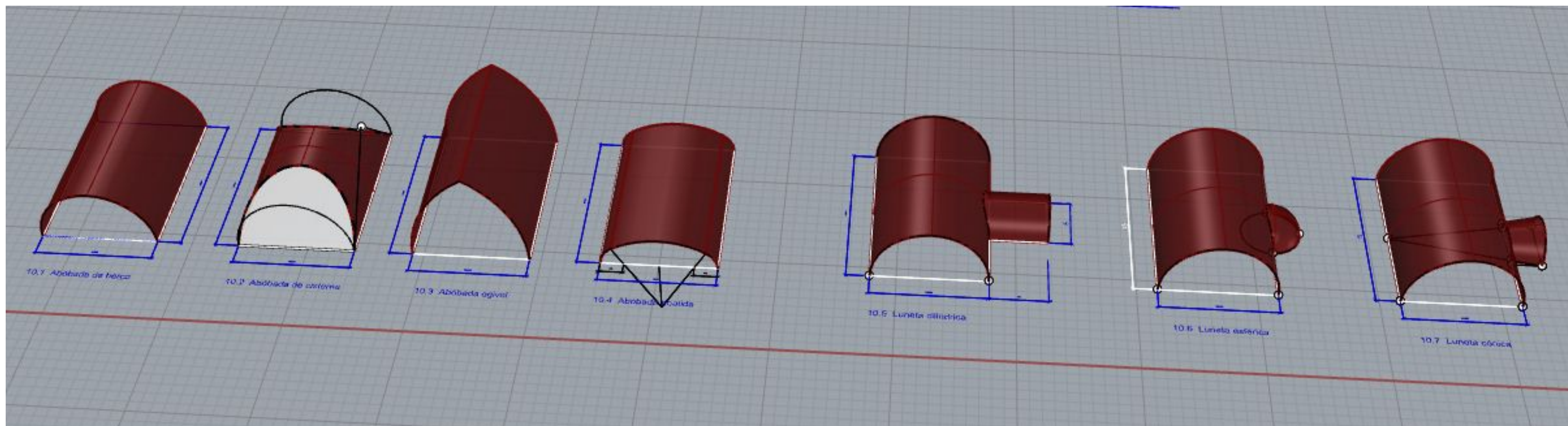


- copy paste, sem a aparte da abobada, fazer um círculo na aresta de (15) do retângulo, com 2,5 de raio
- fazer uma espera no círculo
- extrude do arco, para fazer a abobada
- trim, selecionar o retângulo, e depois as partes de baixo da circunferência
- trim, selecionar a abóbada, enter, e selecionar o resto da circunferência na parte de dentro
- selecionar tudo, interset, enter
- trim, selecionar a linha de dentro da circunferência que est no interior da abóbada, e selecionar a mesma fase da circunferência dentro da abóbada
- passar para a camada de abóbada

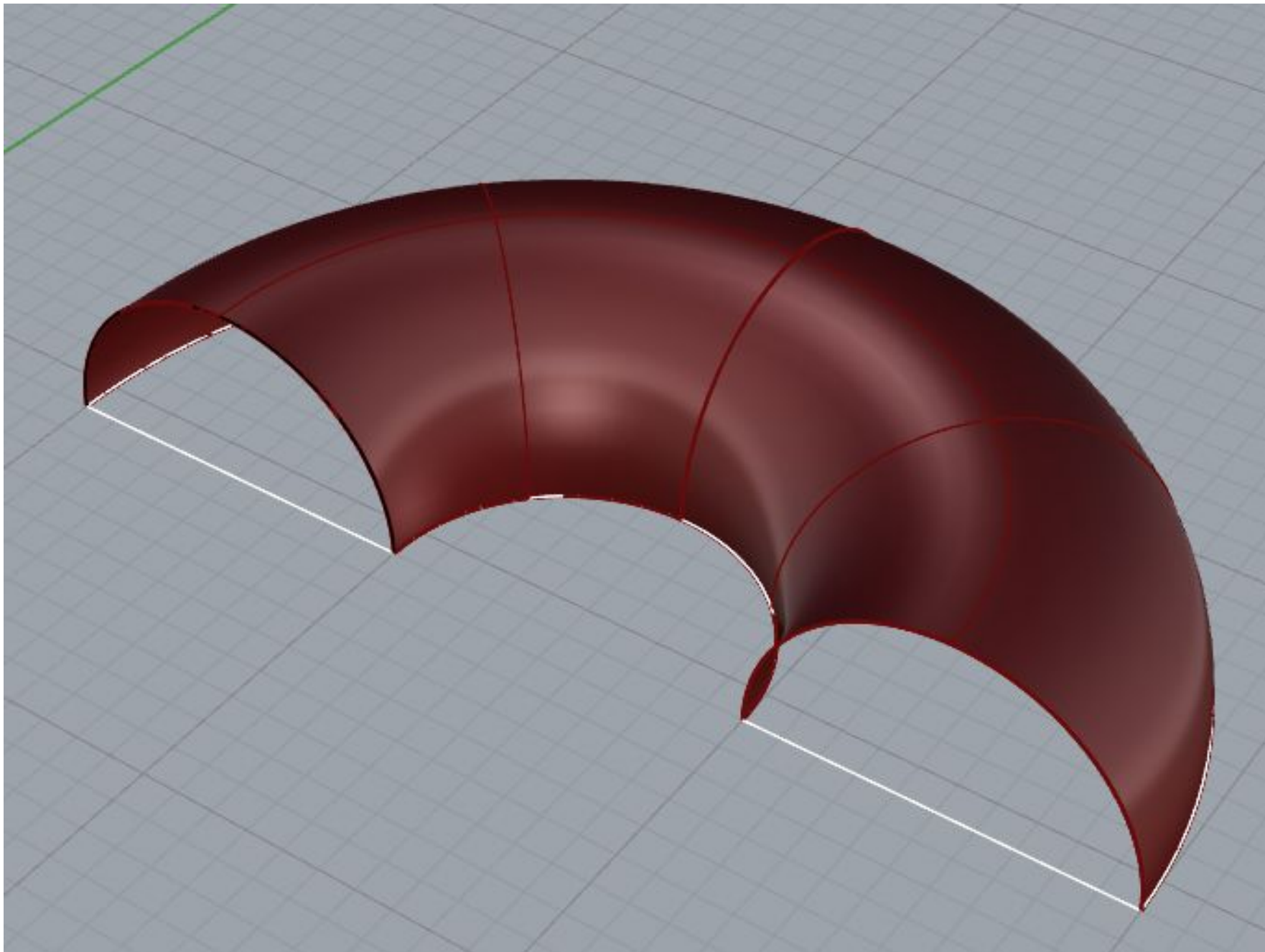
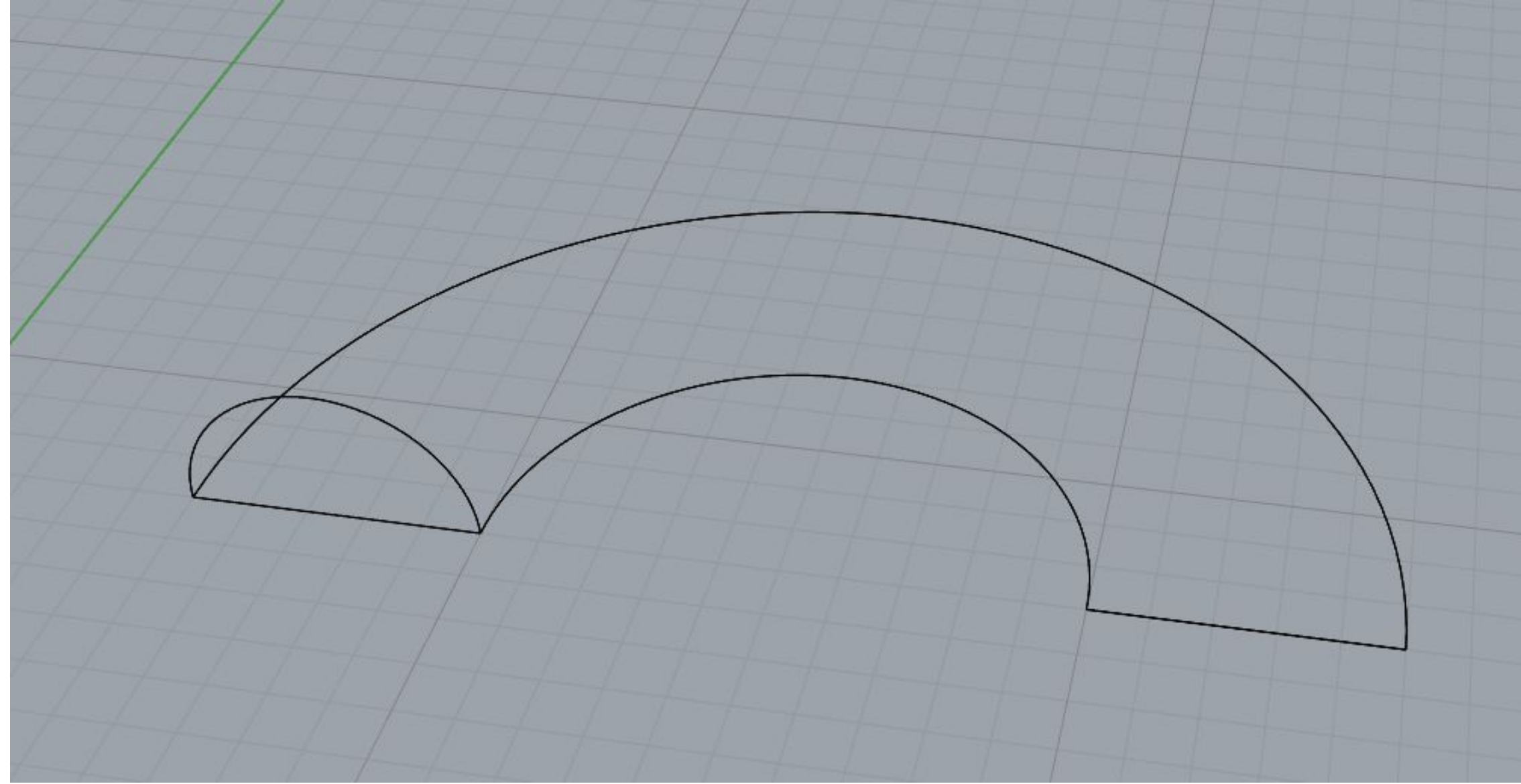
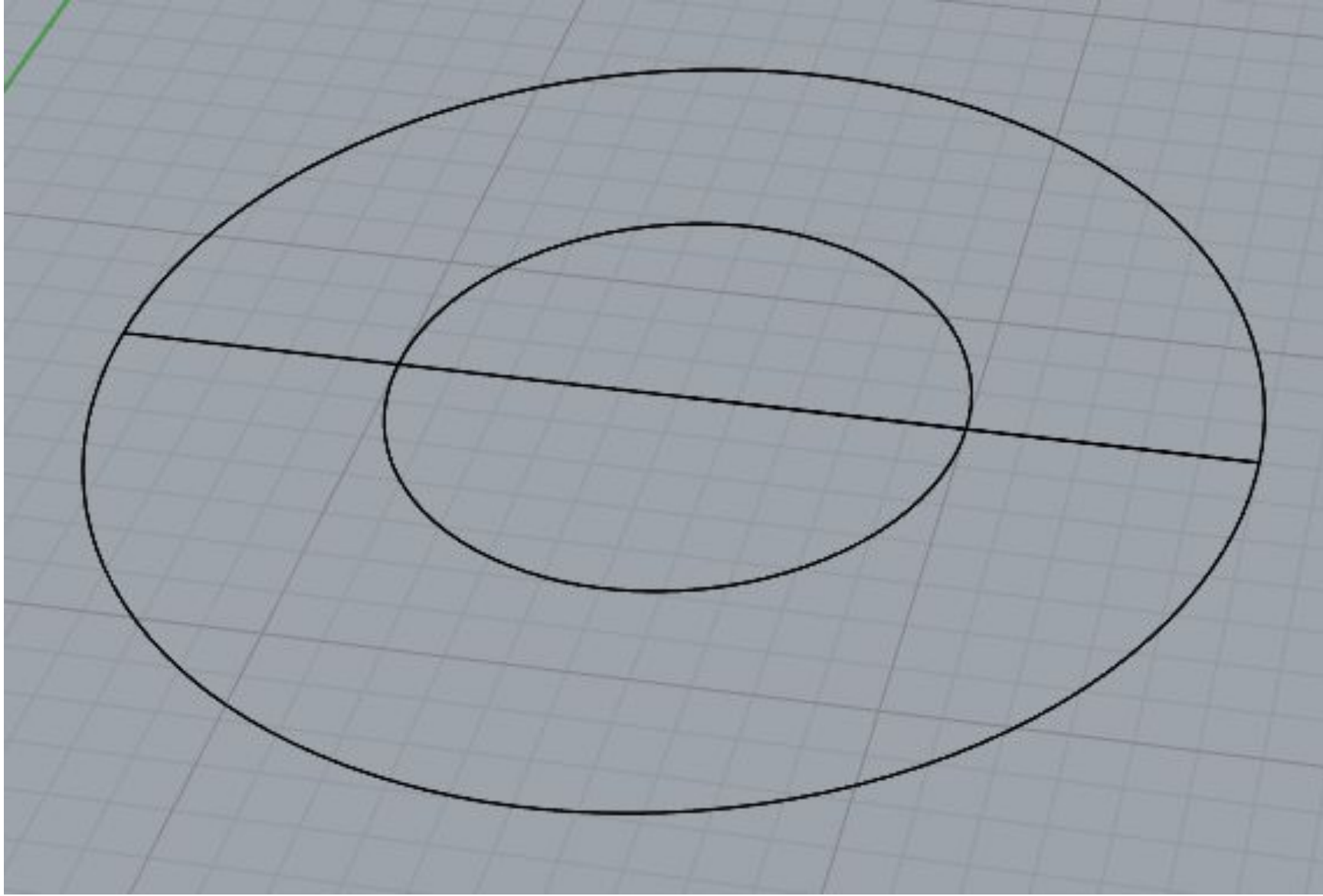
Luneta cônica



- copy paste, sem a aparte da abobada
- fazer na face do retângulo de 15, no midpoint um retângulo com 2.5, 5
- na parte dos 5, midpoint, fazer um cículo vertical
- fazer um triângulo nos vértices do retângulo até ao midpoint do 15 do retângulo maior
- trim, apagar a parte de paixo da circunferência
- railrevolve selecionar o triângulo e o arco, midpoint no diâmetro do arco até à ponta do triângulo = metade de um cone
- trim da parte de dentro do cone que passa abóbada
- selecionar tudo, intersect
- trim para abrir o buraco do cone com a abóbada

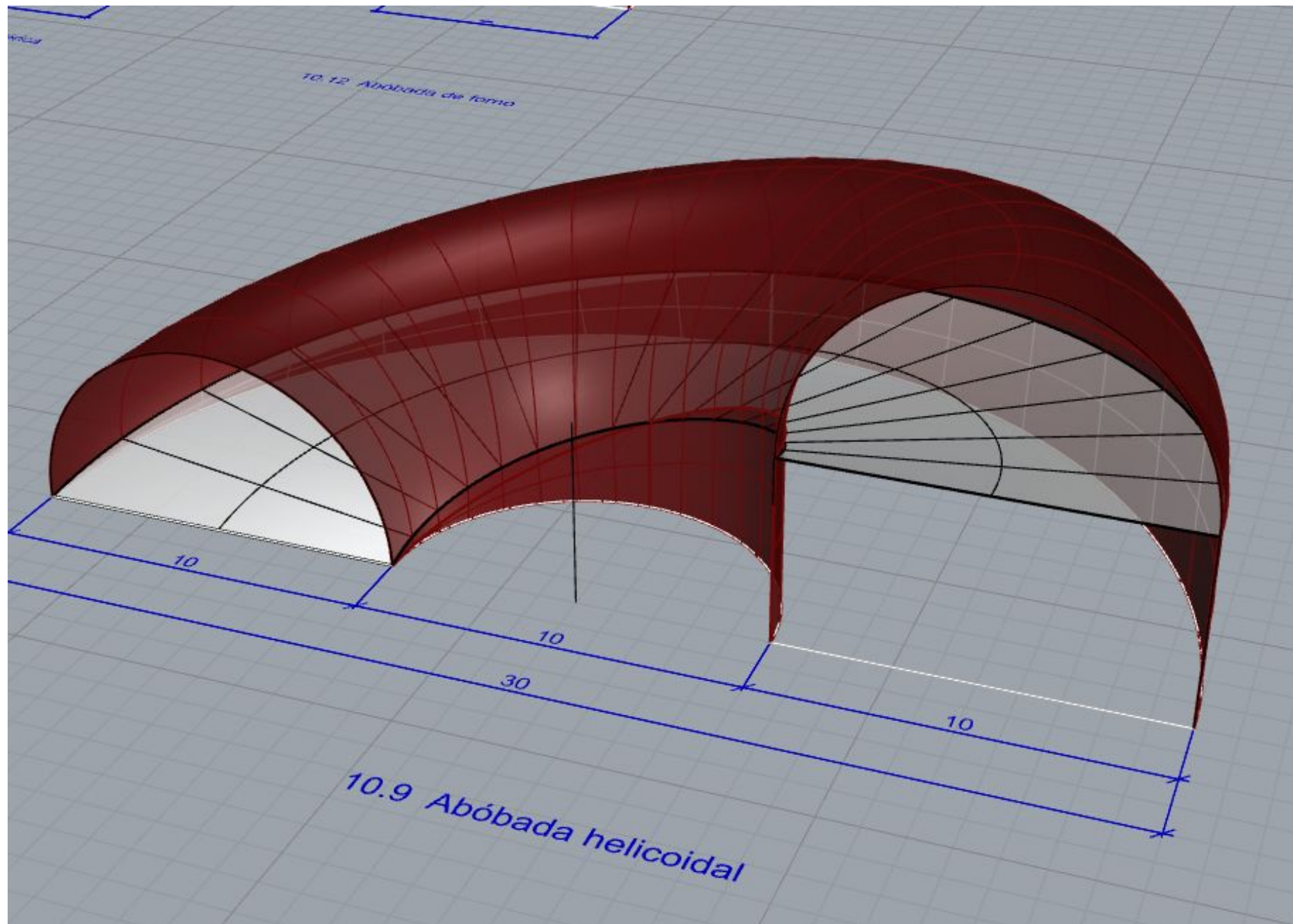
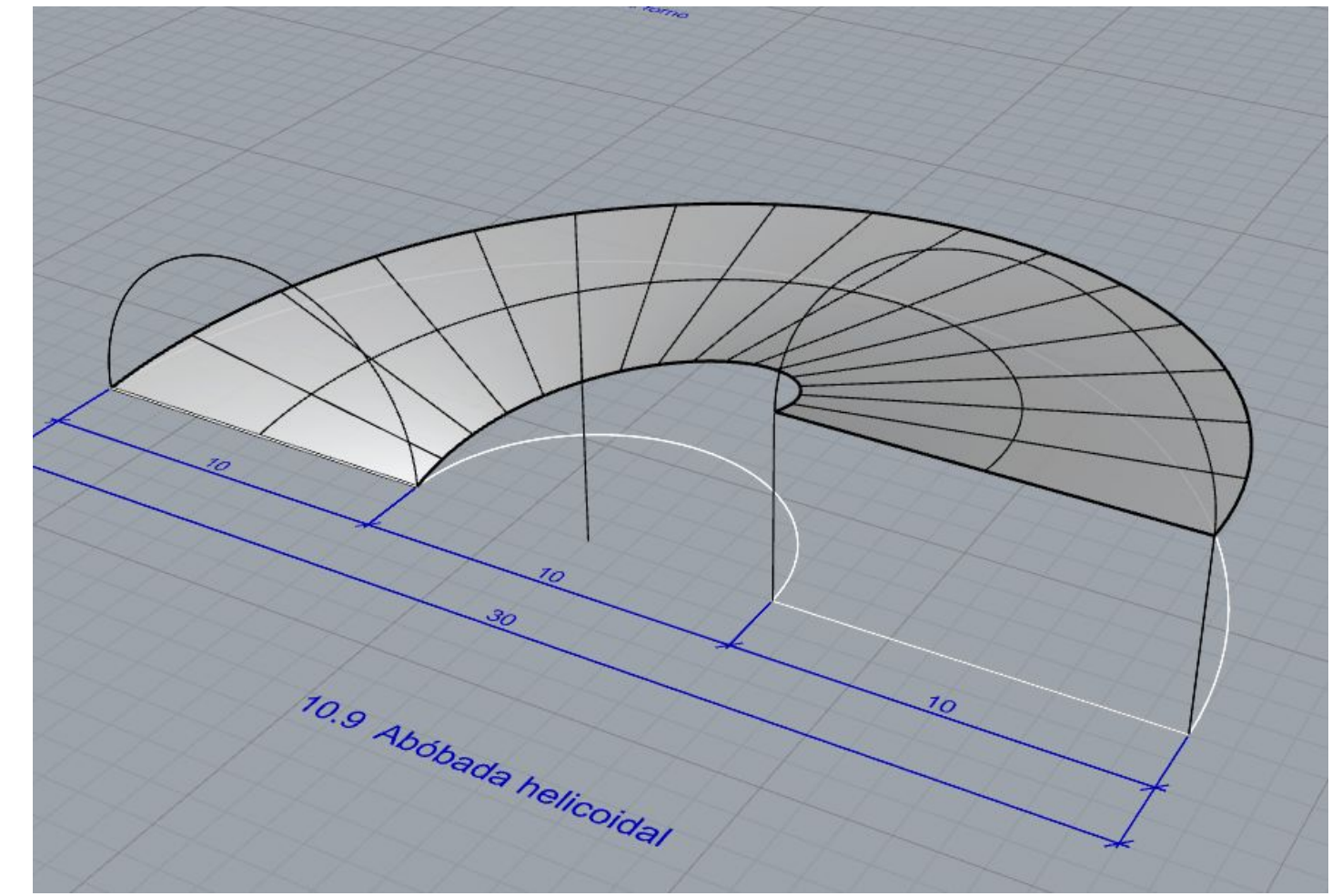
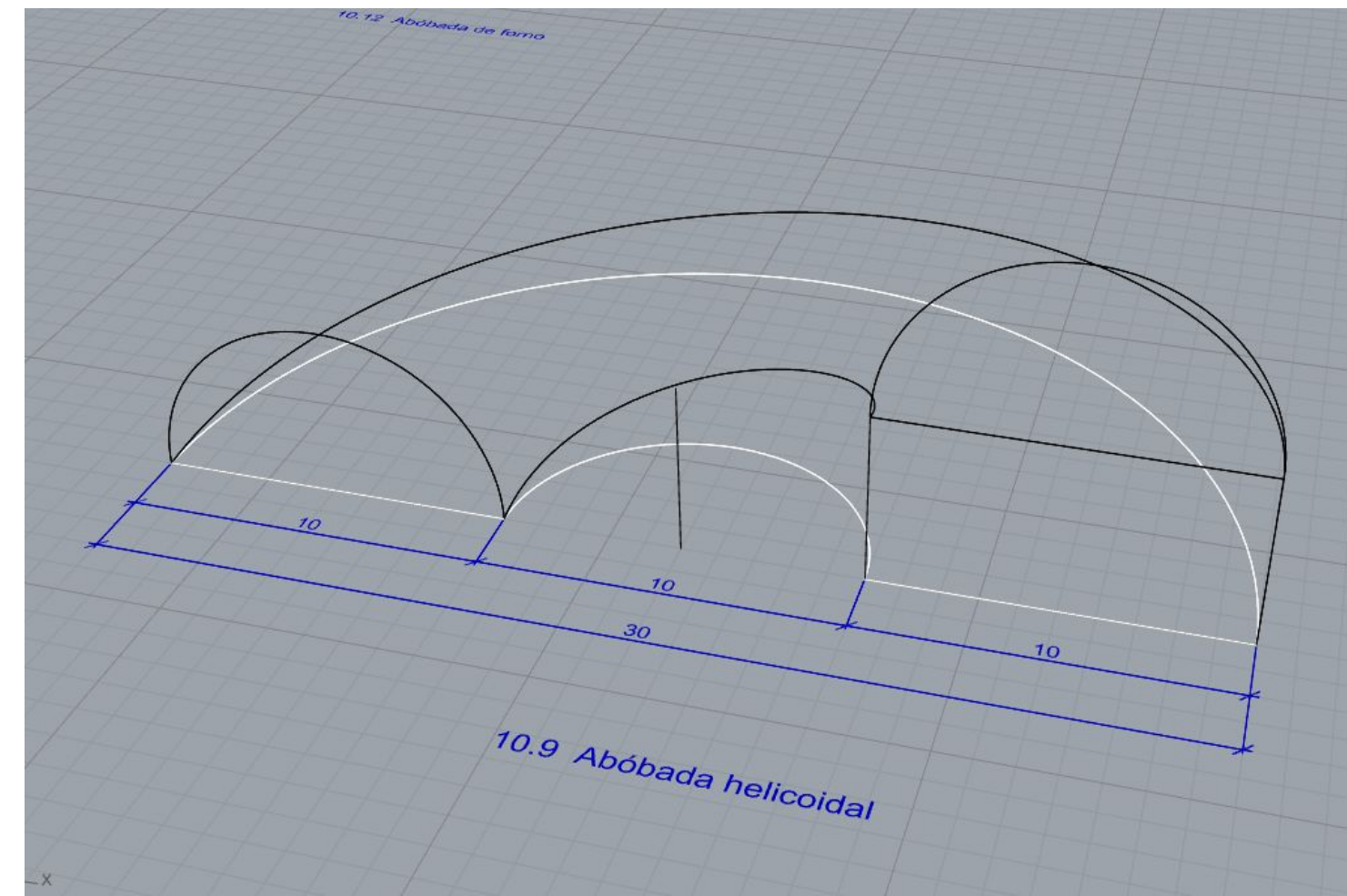
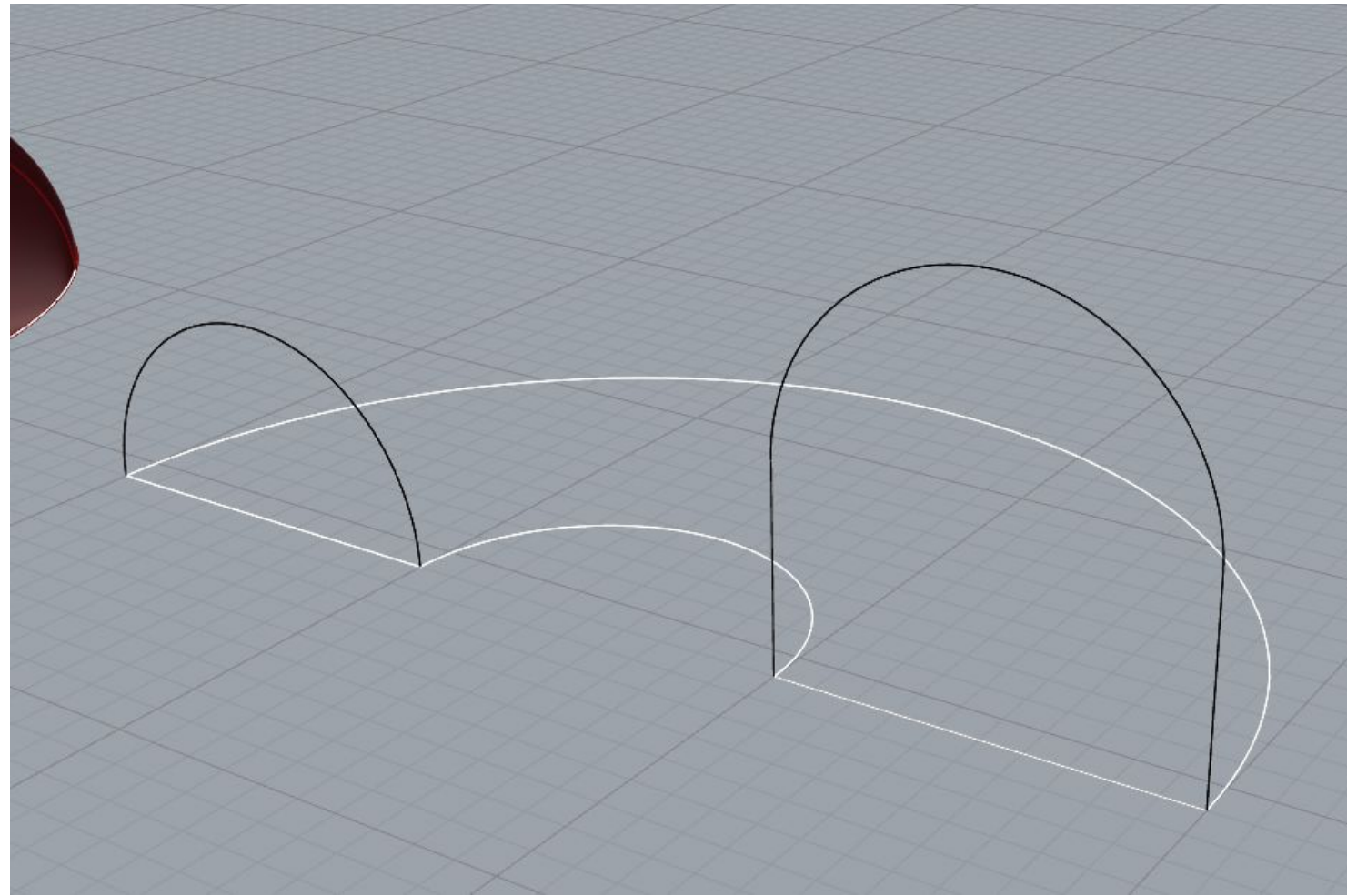


Abóbada toral



- fazer 2 círculos com o mesmo centro, uma com 5 e outra com 10
- fazer uma linha no meio, trim da parte de baixo
- fazer um arco numa das pontas
- trim da parte de baixo
- sweep2, selecionar a circunferência mais pequena, de dentro, depois a maior, de fora, e depois p arco vertical, enter

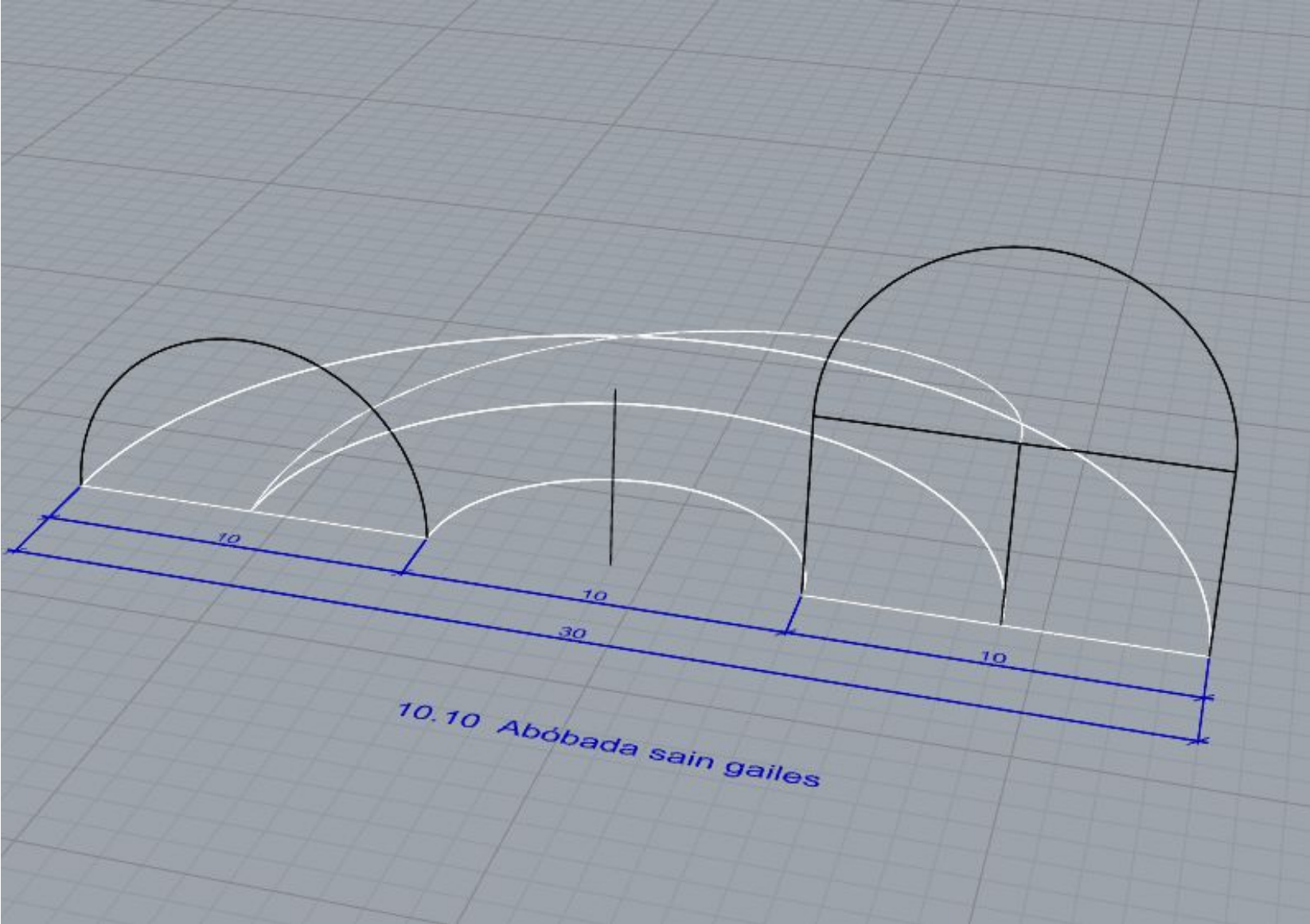
Abóbada helicoidal

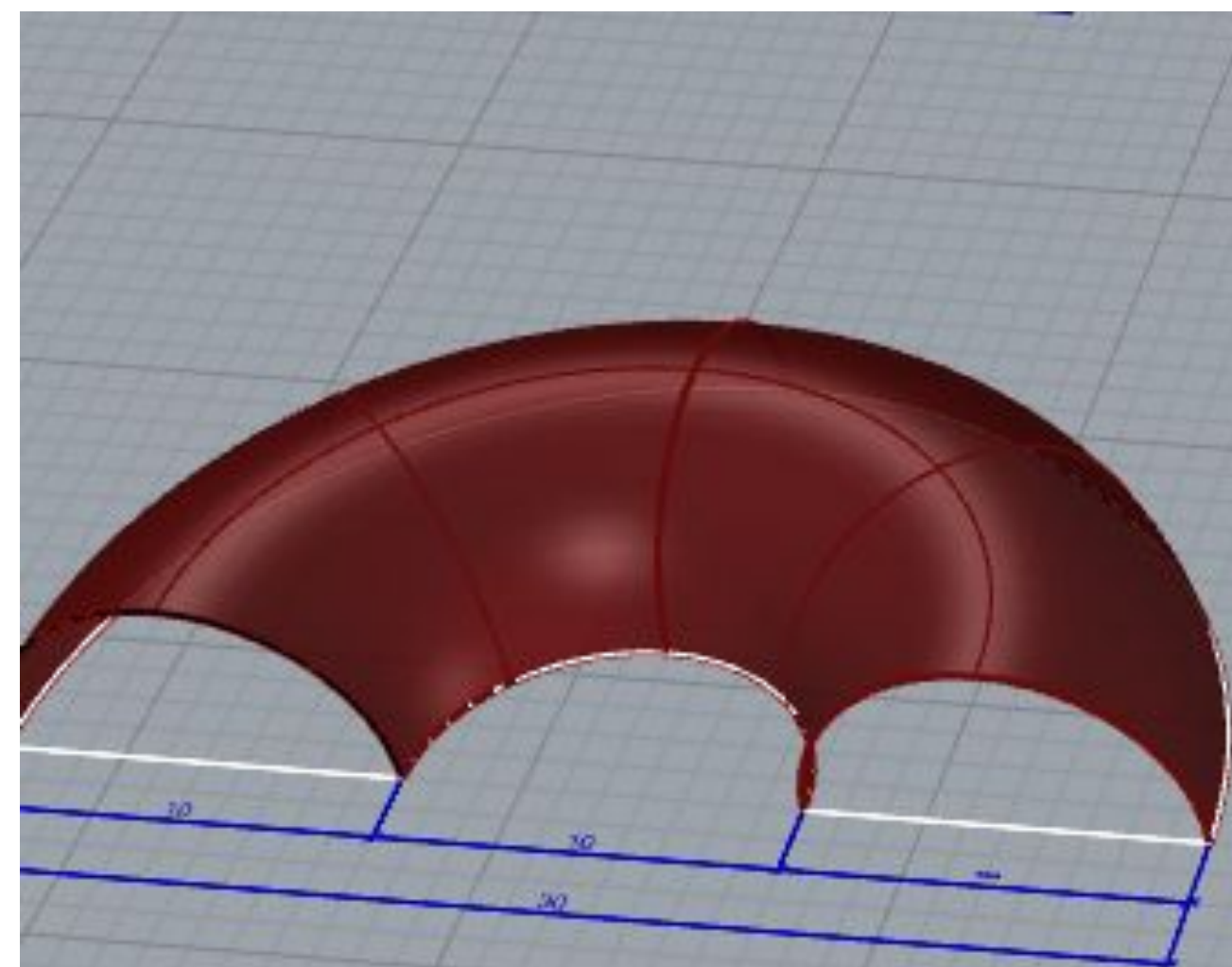


ABÓBADA HELICOIDAL

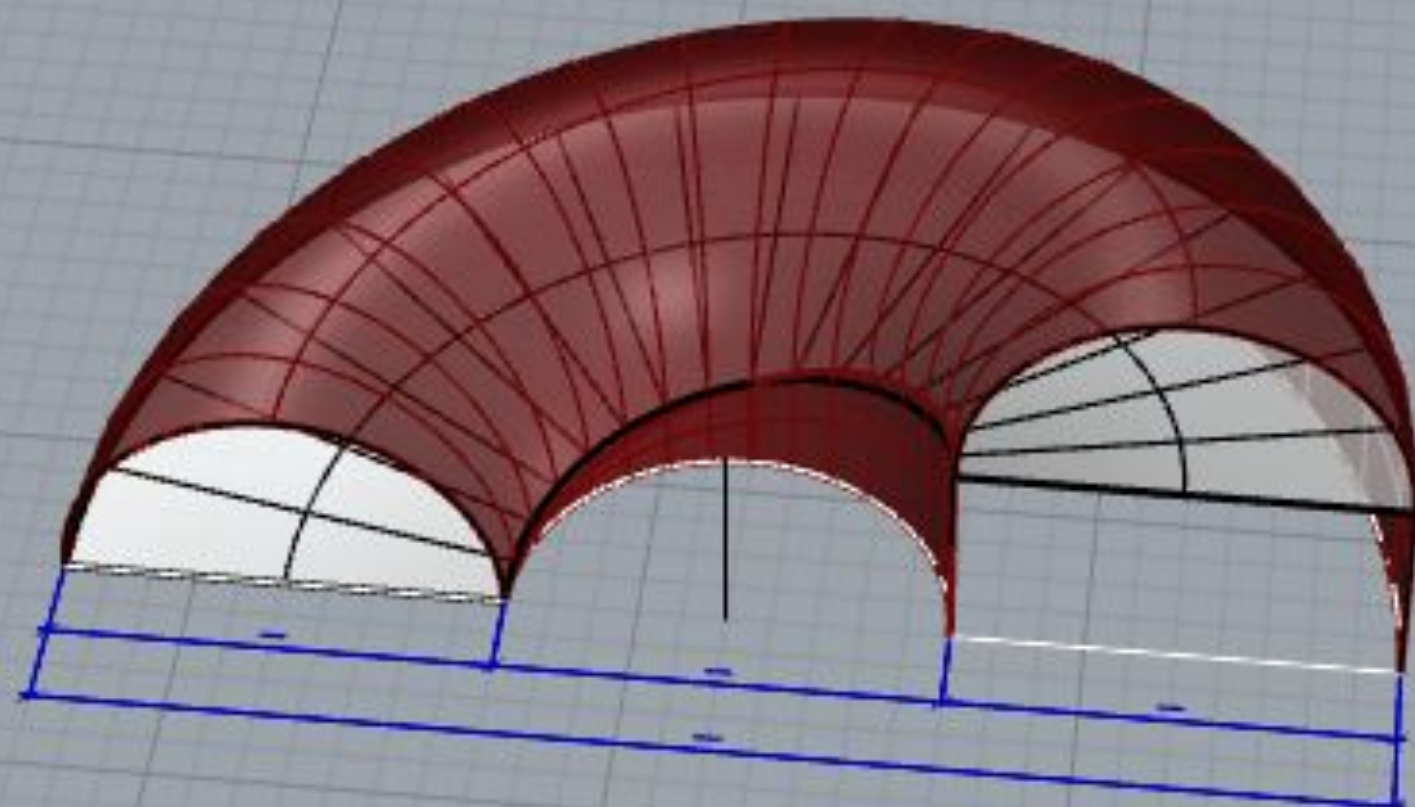
- fazer 2 círculos com o mesmo centro, uma com 5 e outra com 15
- fazer uma linha no meio, trim da parte de baixo
- fazer um arco numa das pontas
- na outra ponta fazer um retângulo vertical com 5 de altura e com uma circunferência vertical com o midpoint da aresta superior do retângulo
- trimp da parte de baixo da circunferência
- sweep2, selecionar o círculo menor, depois o maior, depois o 1 arco, e depois o 2 que é o maior, enter
- fazer uma line vertical no centro em comum dos dois círculos com 5 de altura
- loft selecionar a linha do círculo menor de base e a linha da abobada, enter
- Helix, selecionar a linha vertical central, no turns=0.5, Mode=pitch, maior e mais pequena
- sweep2, da Helix

Abóbada Sain Gilles

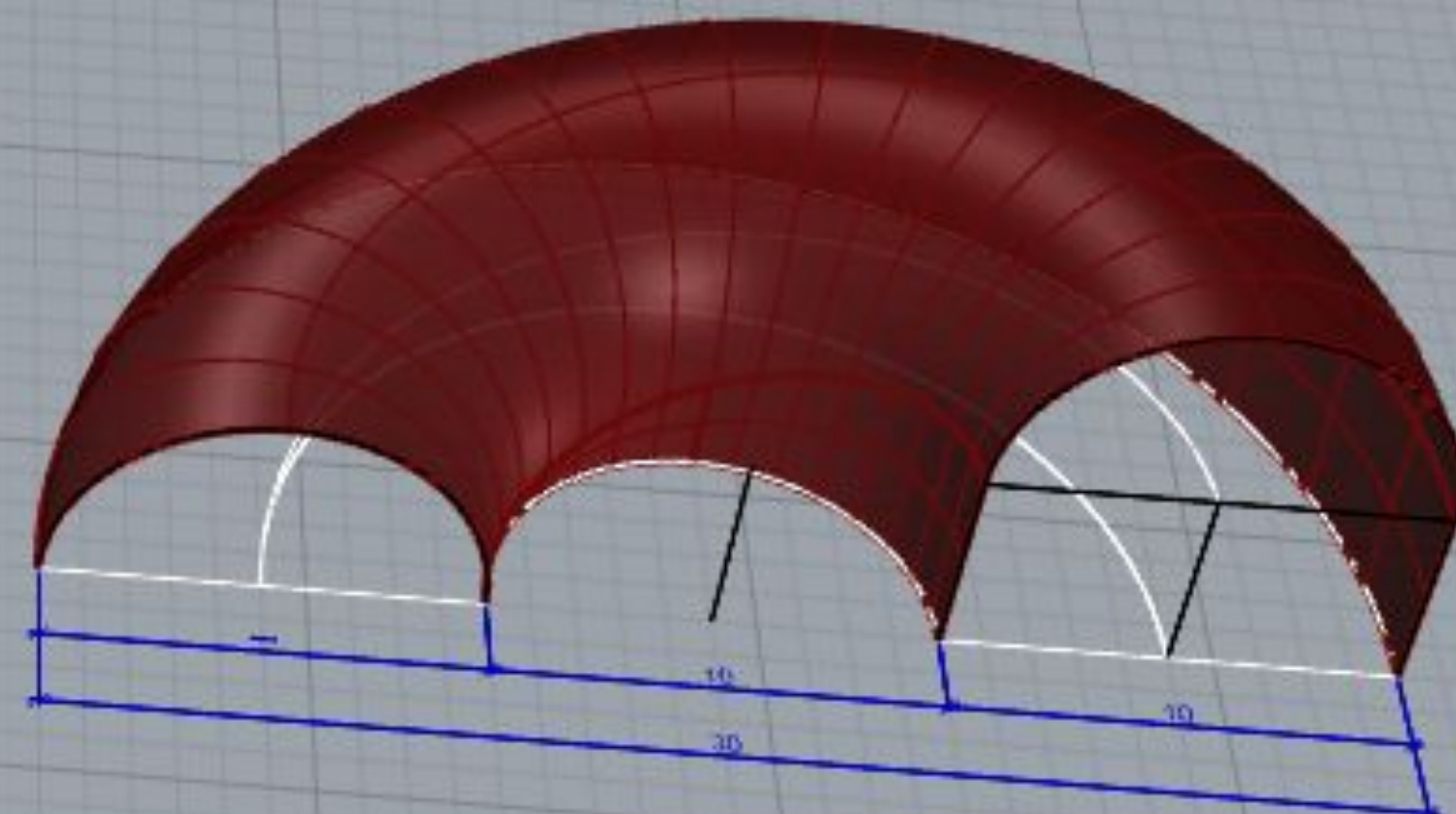




10.8 Abóbada toral

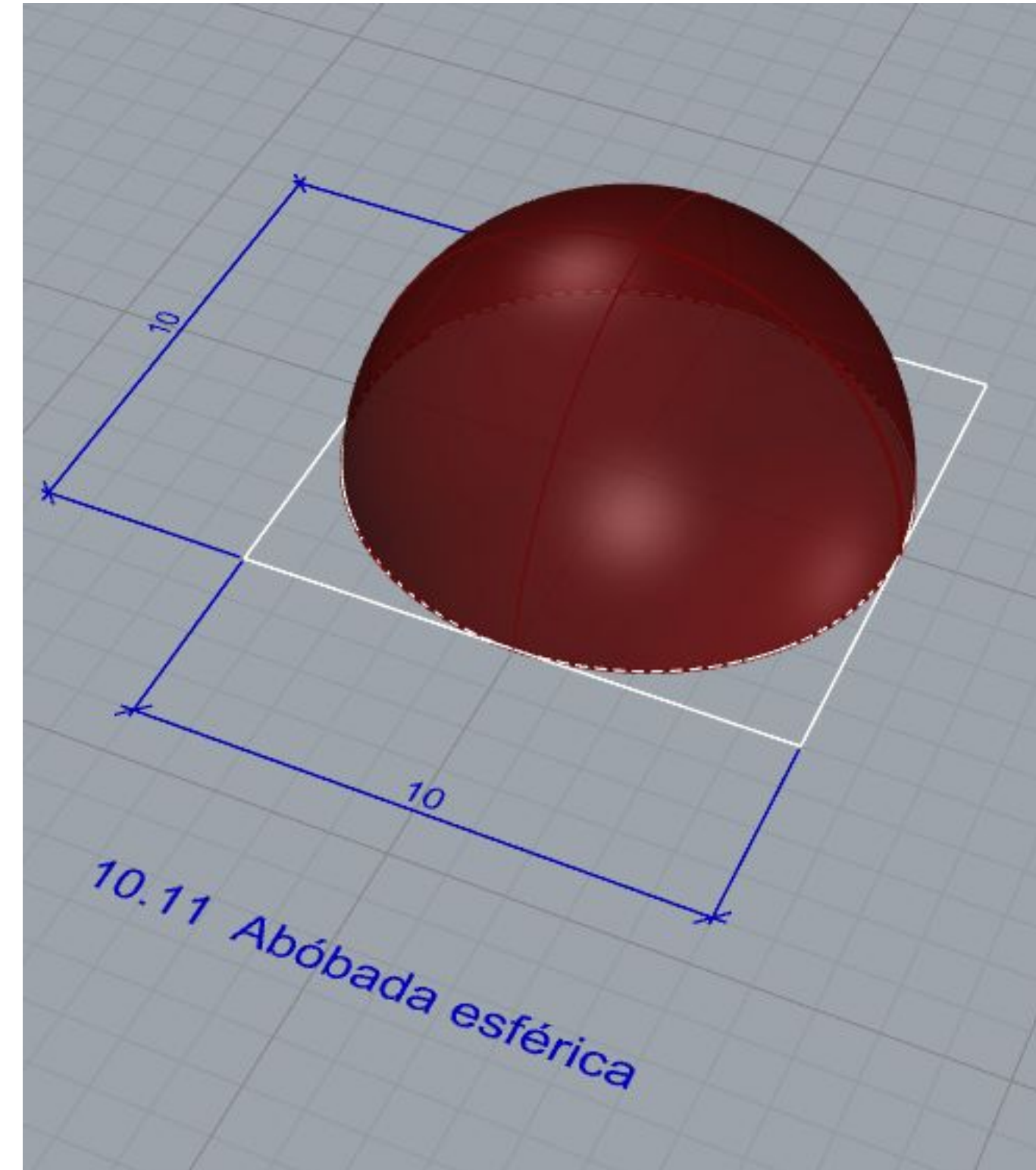
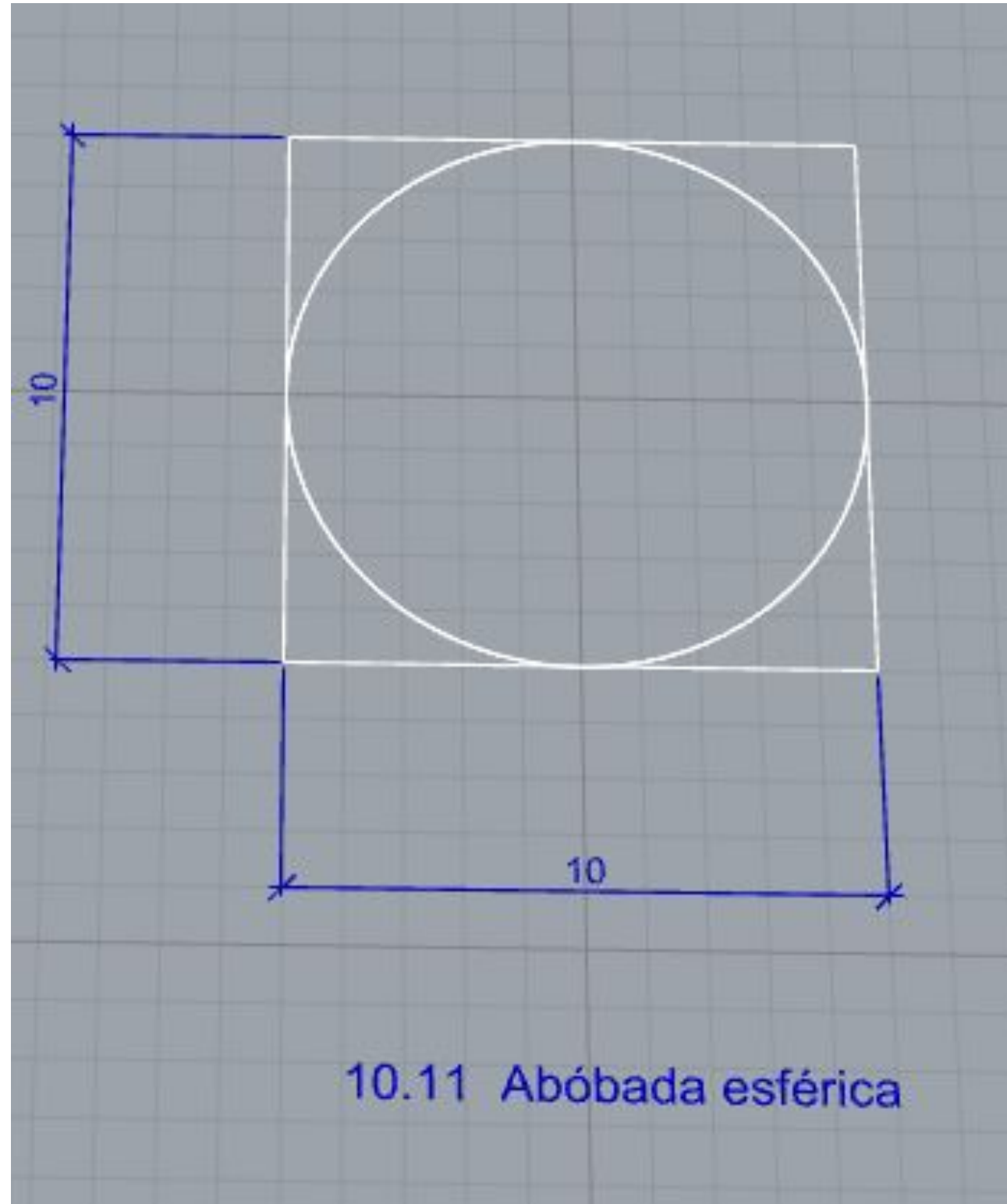


10.9 Abóbada helicoidal



10.10 Abóbada sain gales

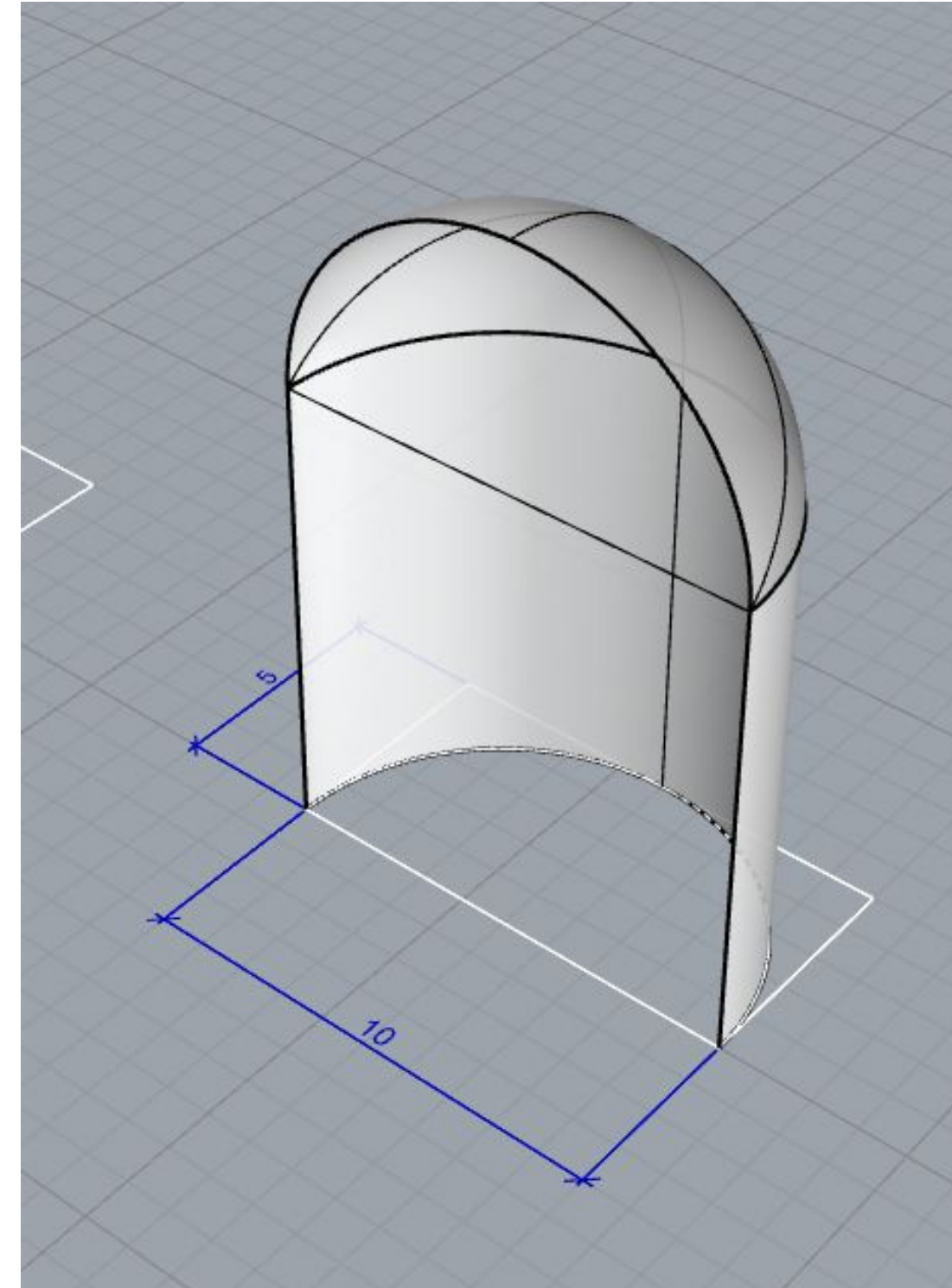
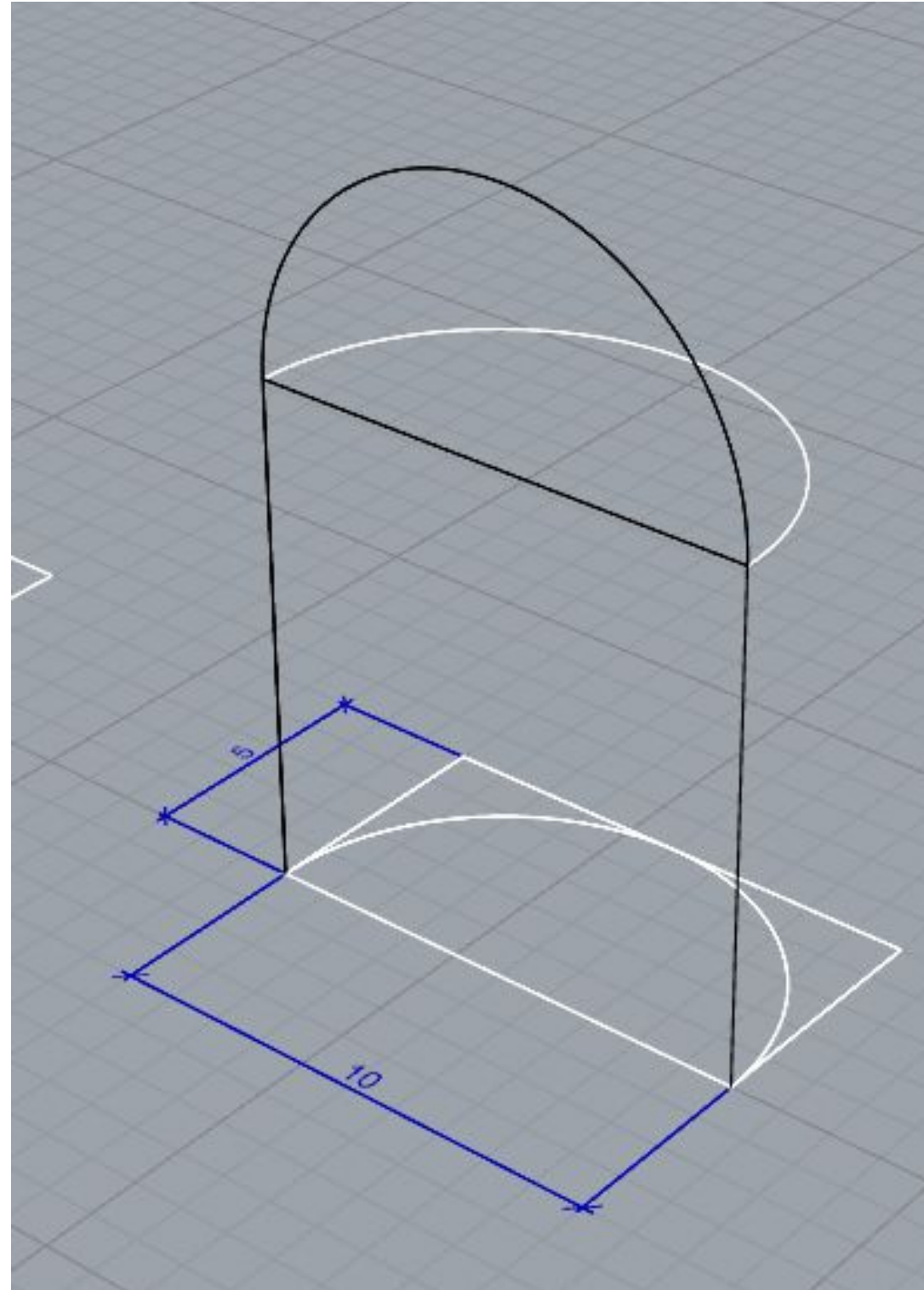
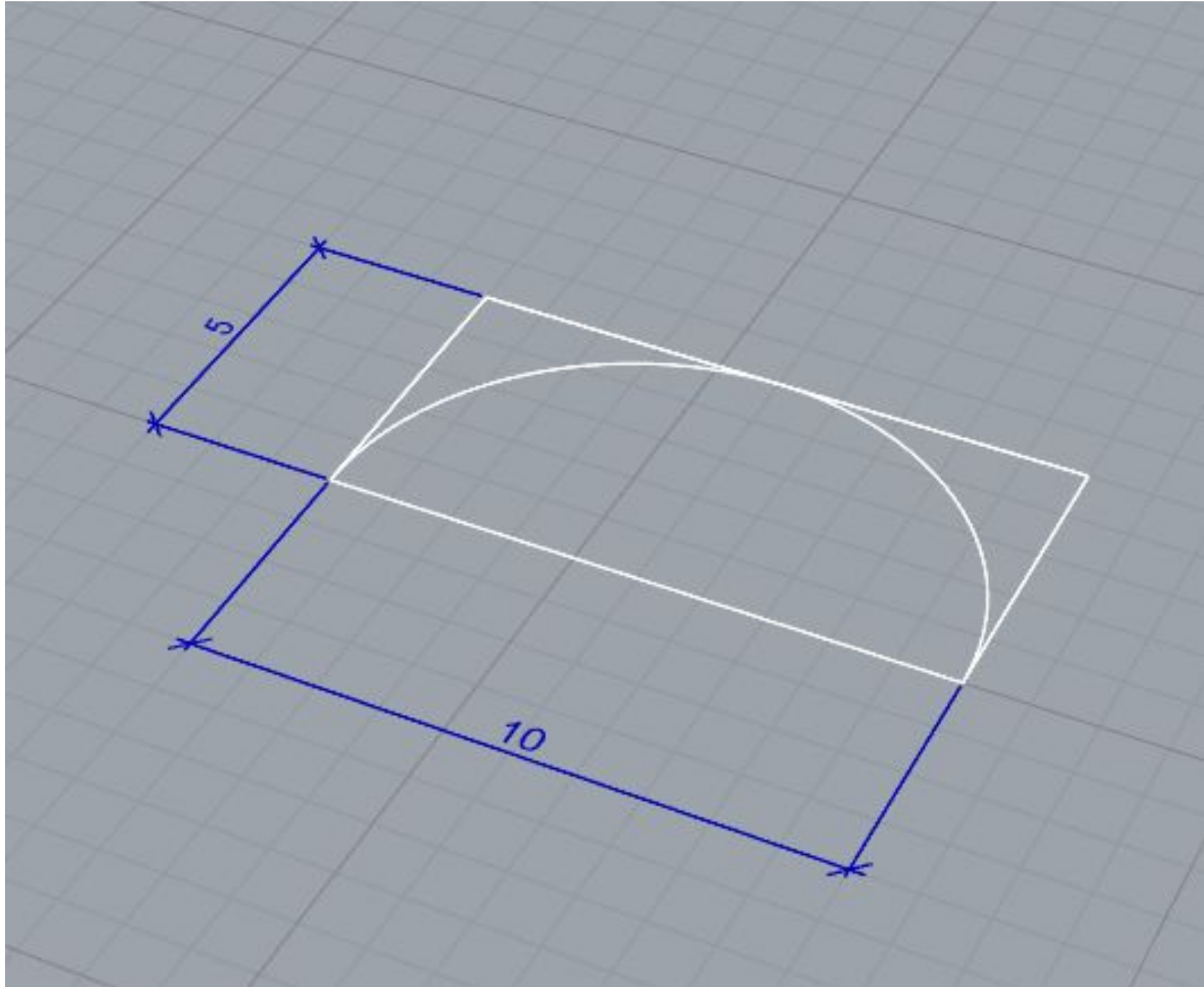
Abóbada esférica



ABÓBADA ESFÉRICA

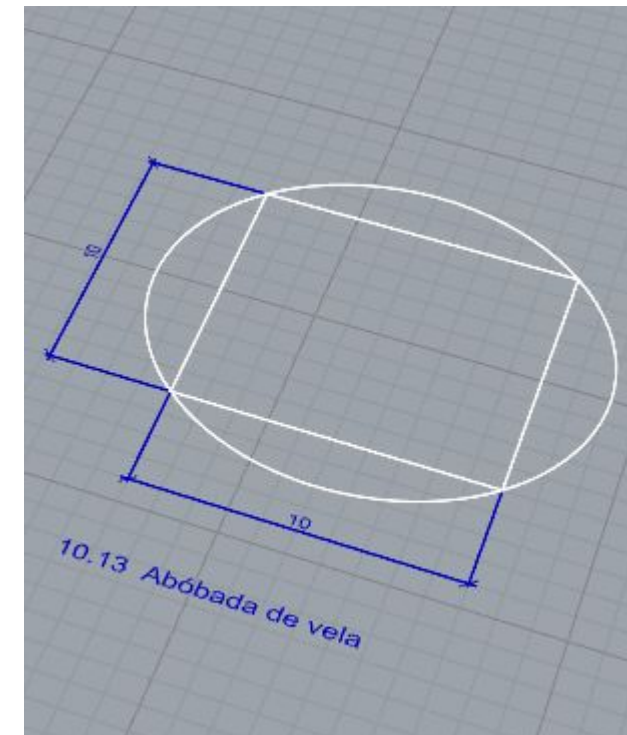
- quadrado com @20,20
- círculo com centro no quadrado e raio até ao limite do mesmo
- box circular no círculo
- trim da parte de baixo

Abóbada de forno

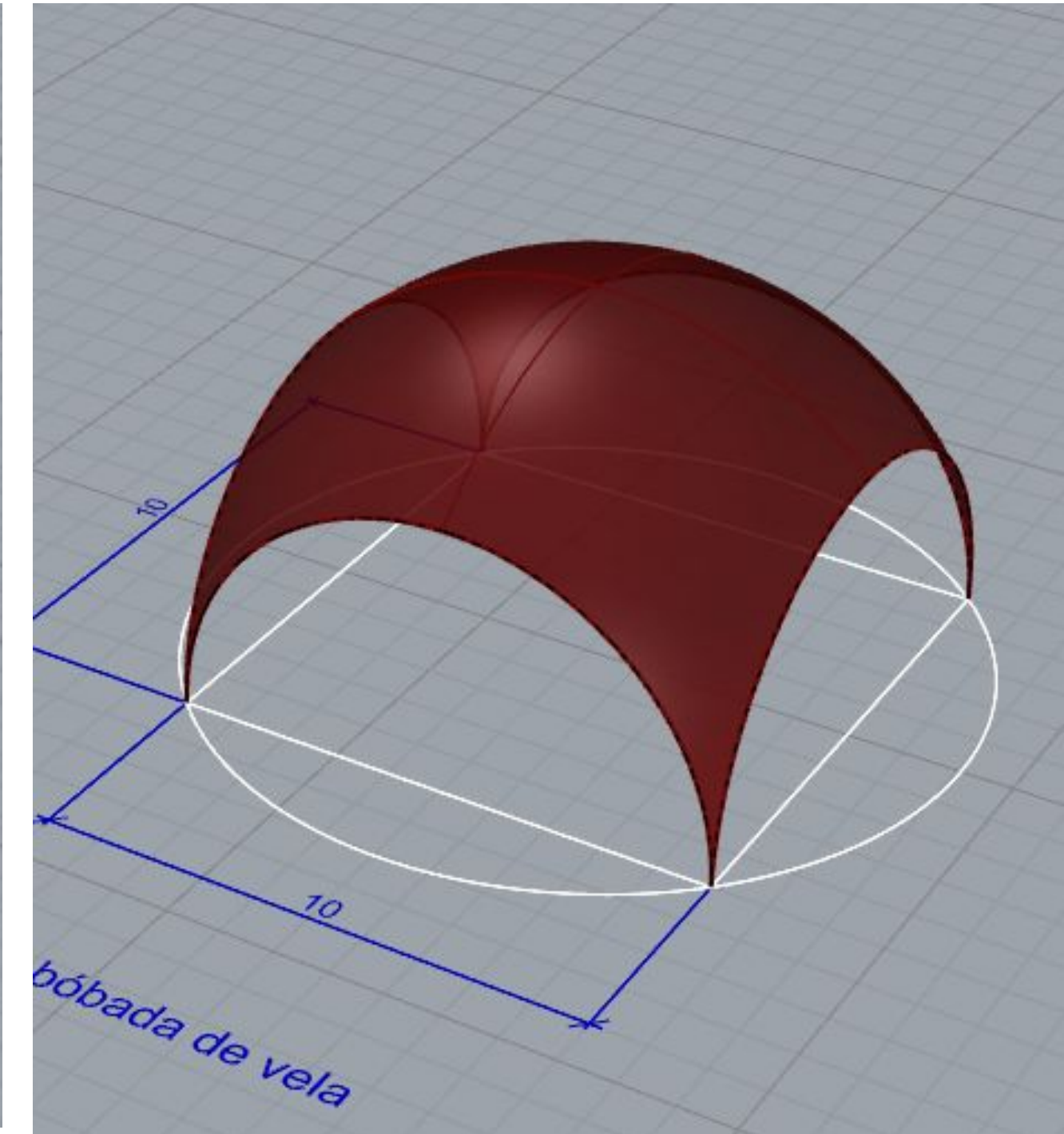
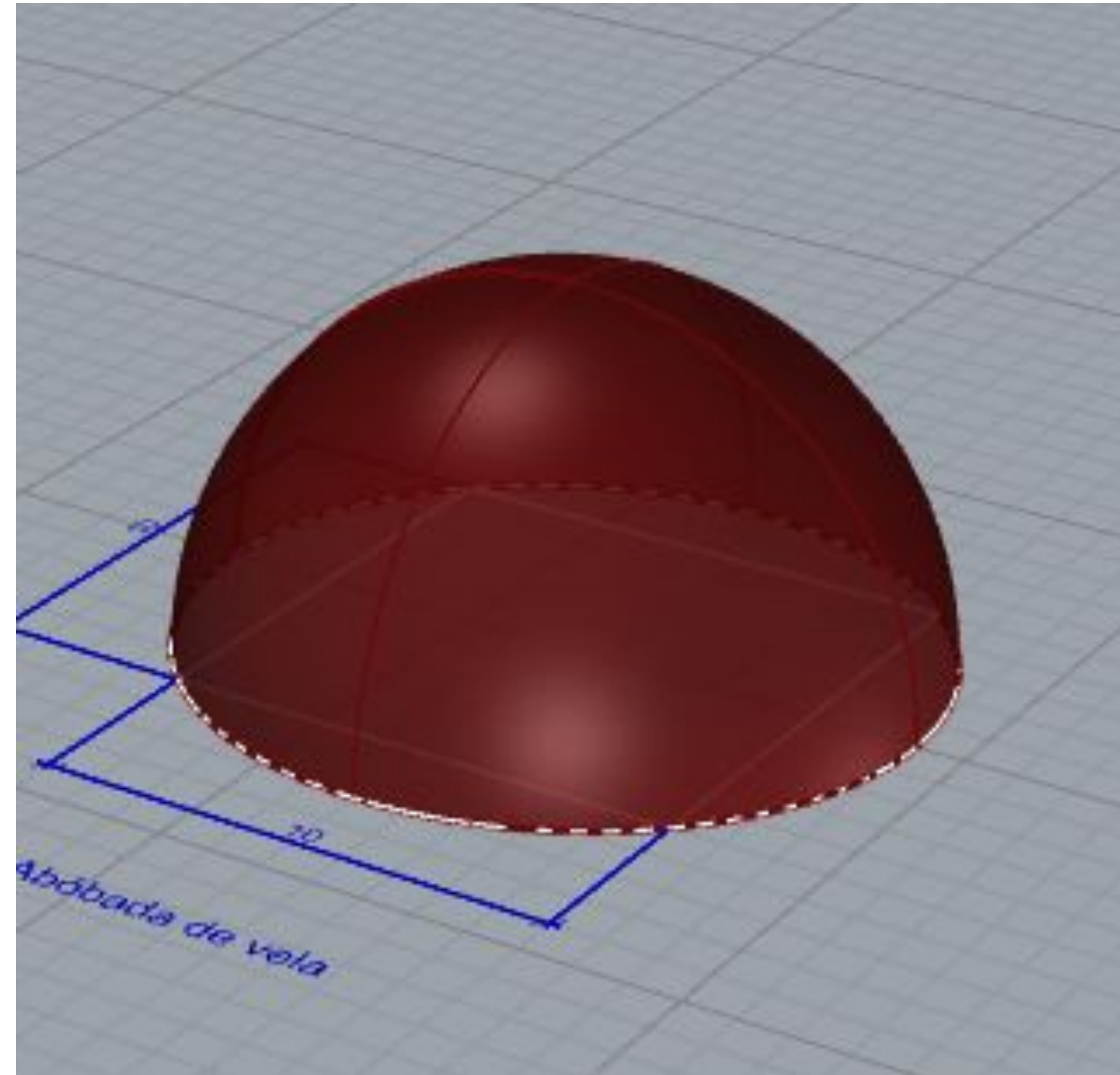
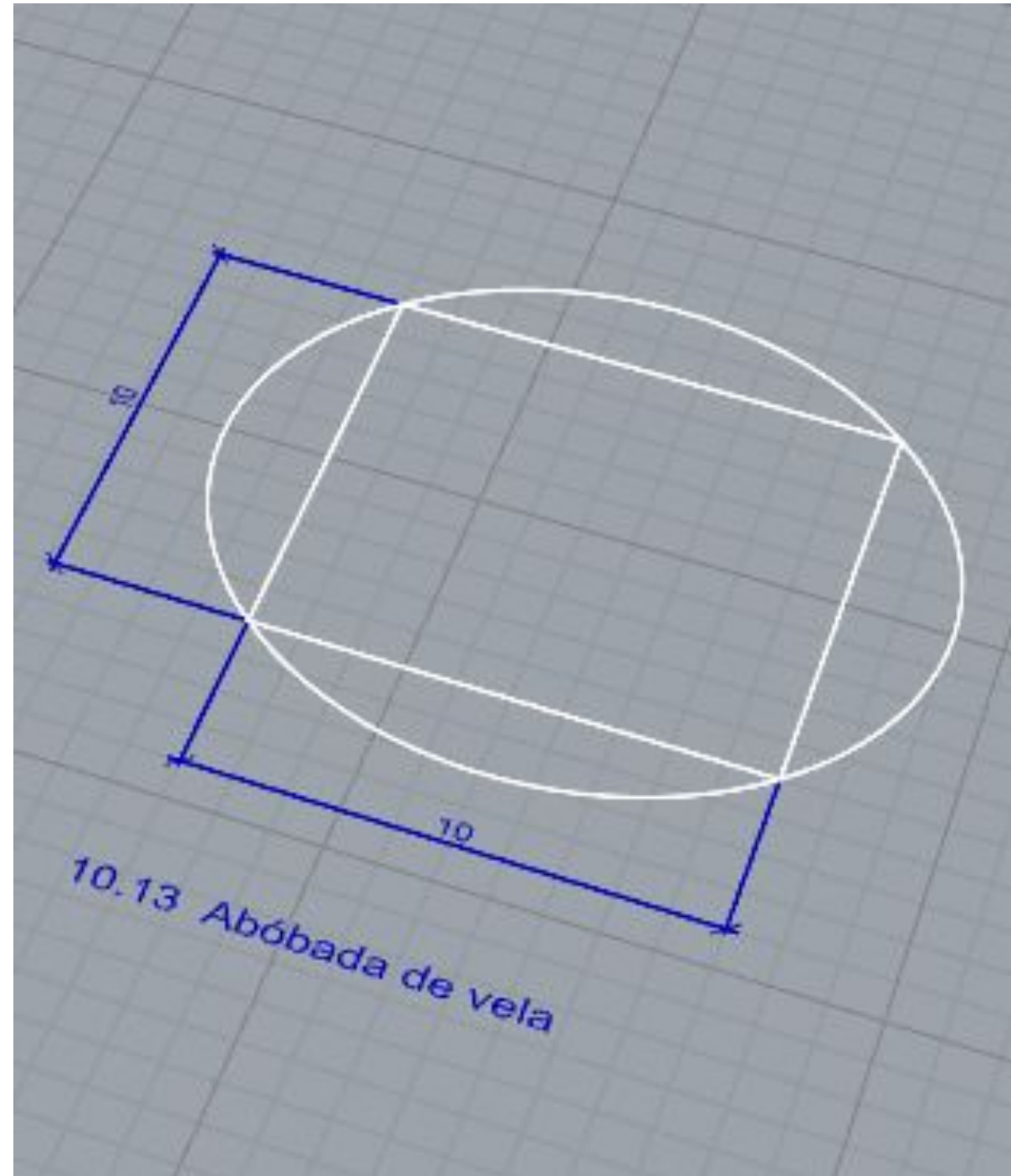


ABÓBADA DE FORNO

- copy da base anterior
- fazer um quadrado até ao centro do anterior e fazer trim da parte de baixo do anterior
- lines verticais com 10 nos cantos inferiores do retângulo
- circunferência vertical, trim da parte de baixo
- copiar a semi circunferência inferior para cima
- extrusion da semi circunferência inferior até à superior
- revolve, seleccionar o semi círculo superior, no seleccionar o ponto esq e depois o dir da linha horizontal da semi.circ, no ângulo carregar no shift no mid point na curva da circunferência e puxar para cima (90°)



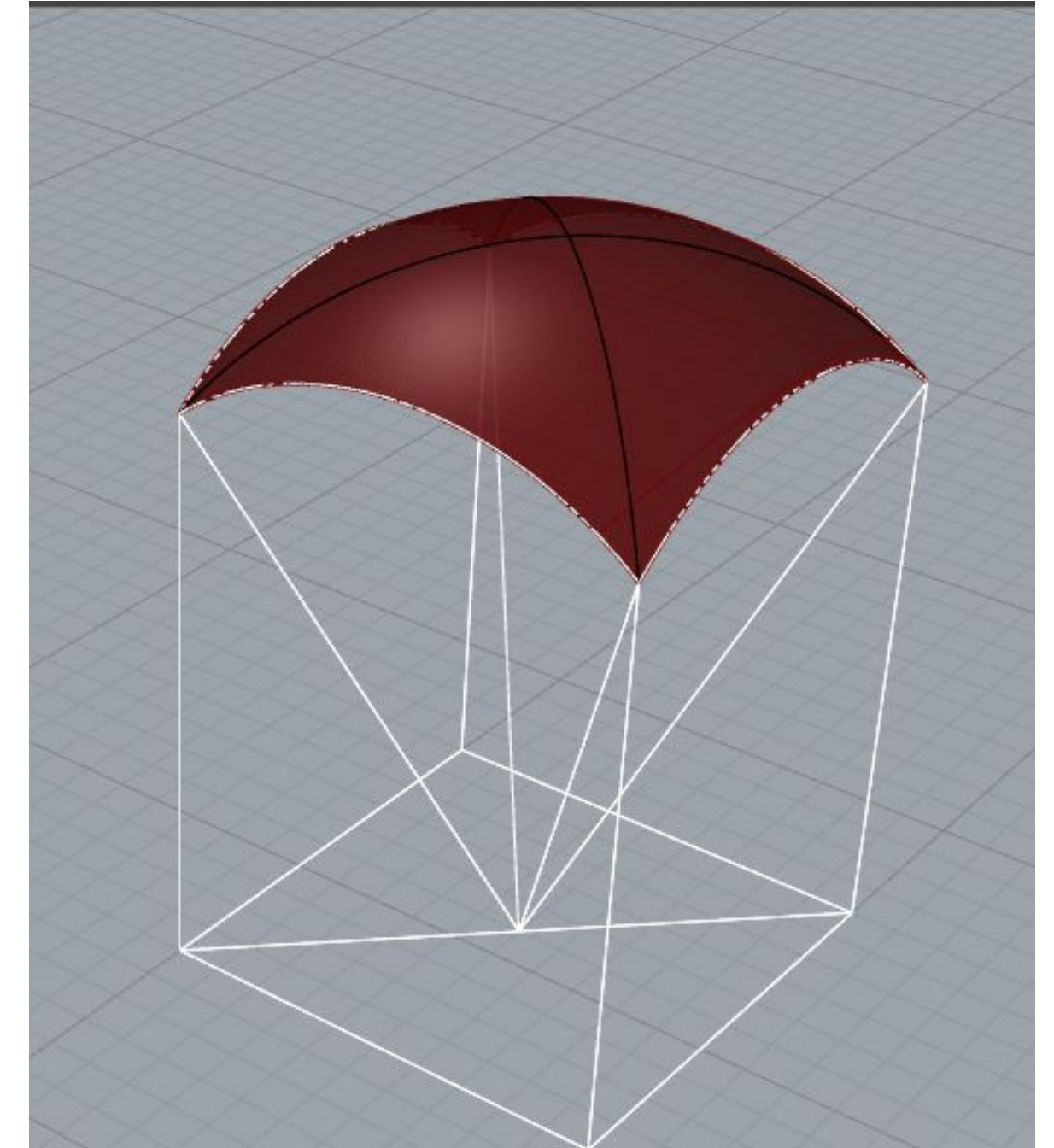
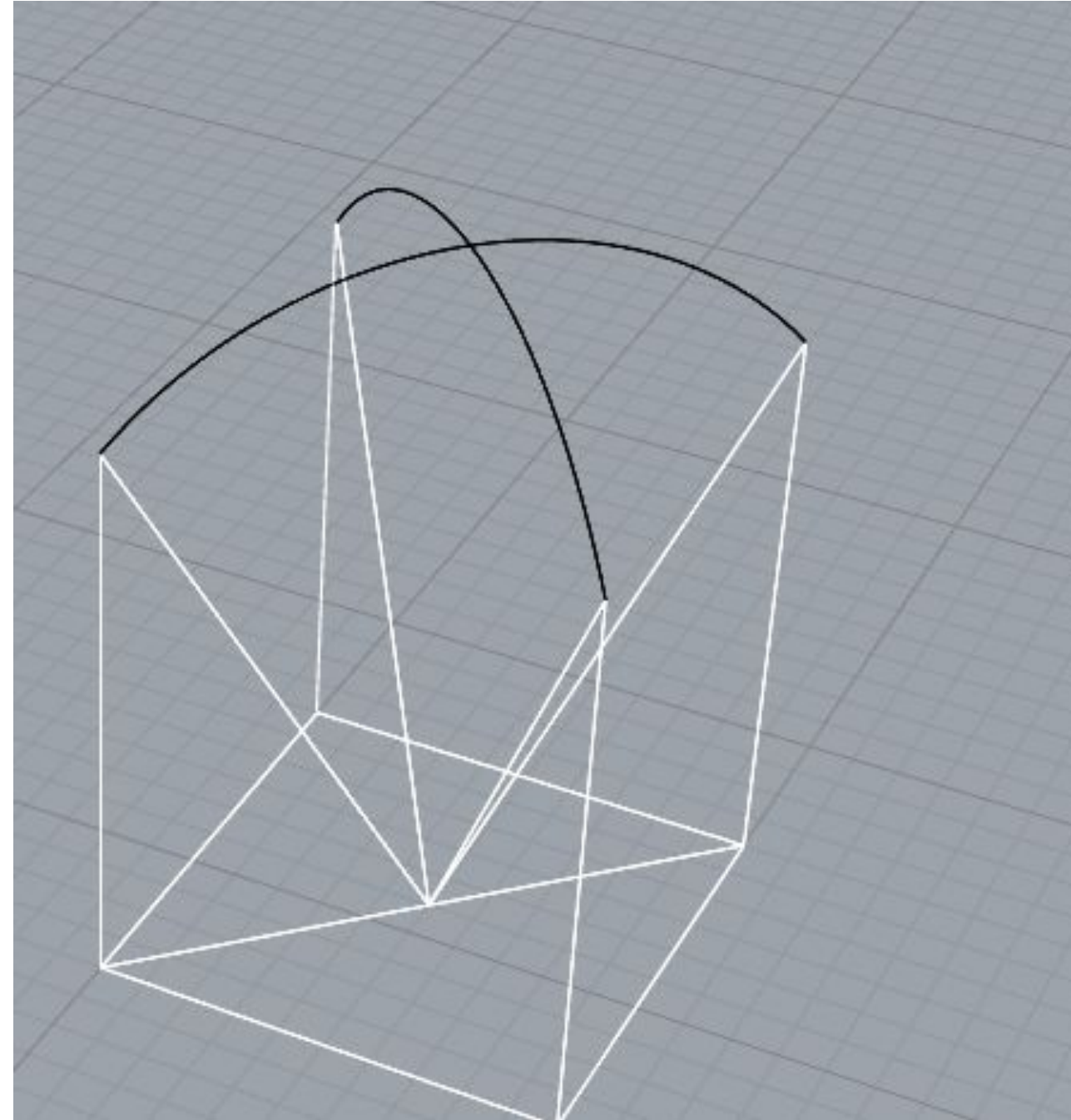
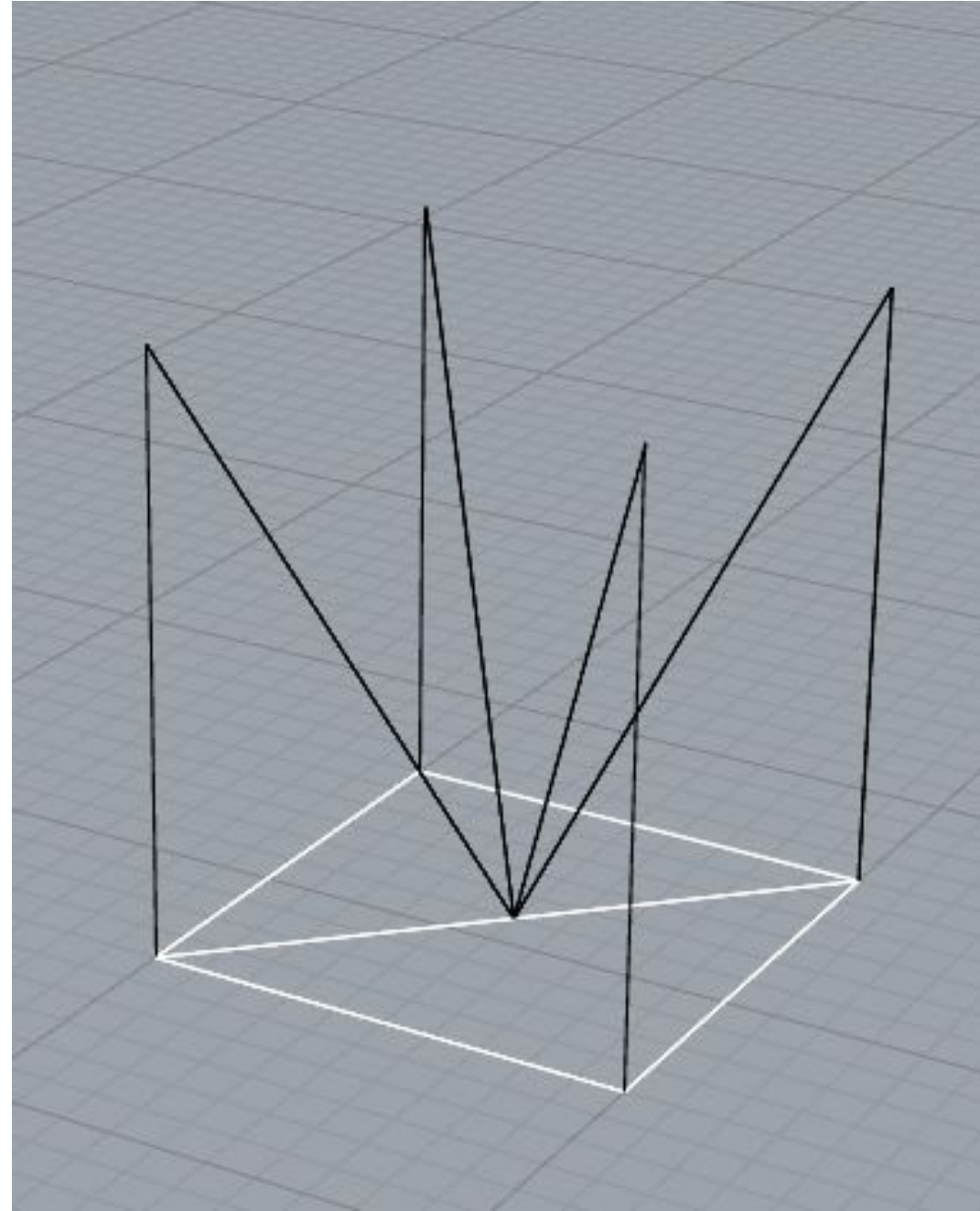
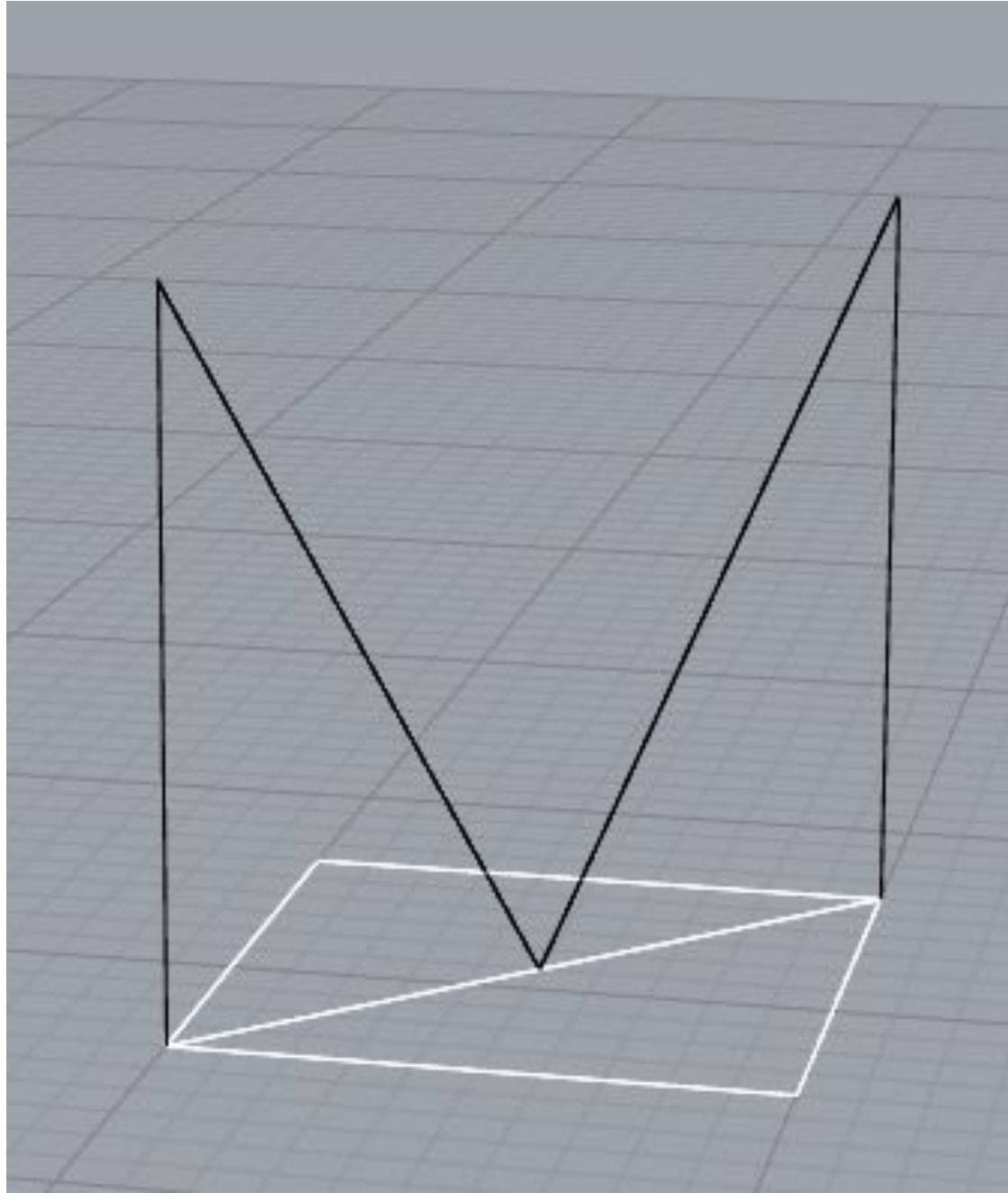
Abóbada de vela



ABOBADA DE VELA

- copiar a base da abóbada esférica, contido o limite do círculo toca nas arestas do quadrado
- fazer a esfera sólida, trim da parte de baixo
- seleccionar o quadrado, project, seleccionar a esfera, enter, trim

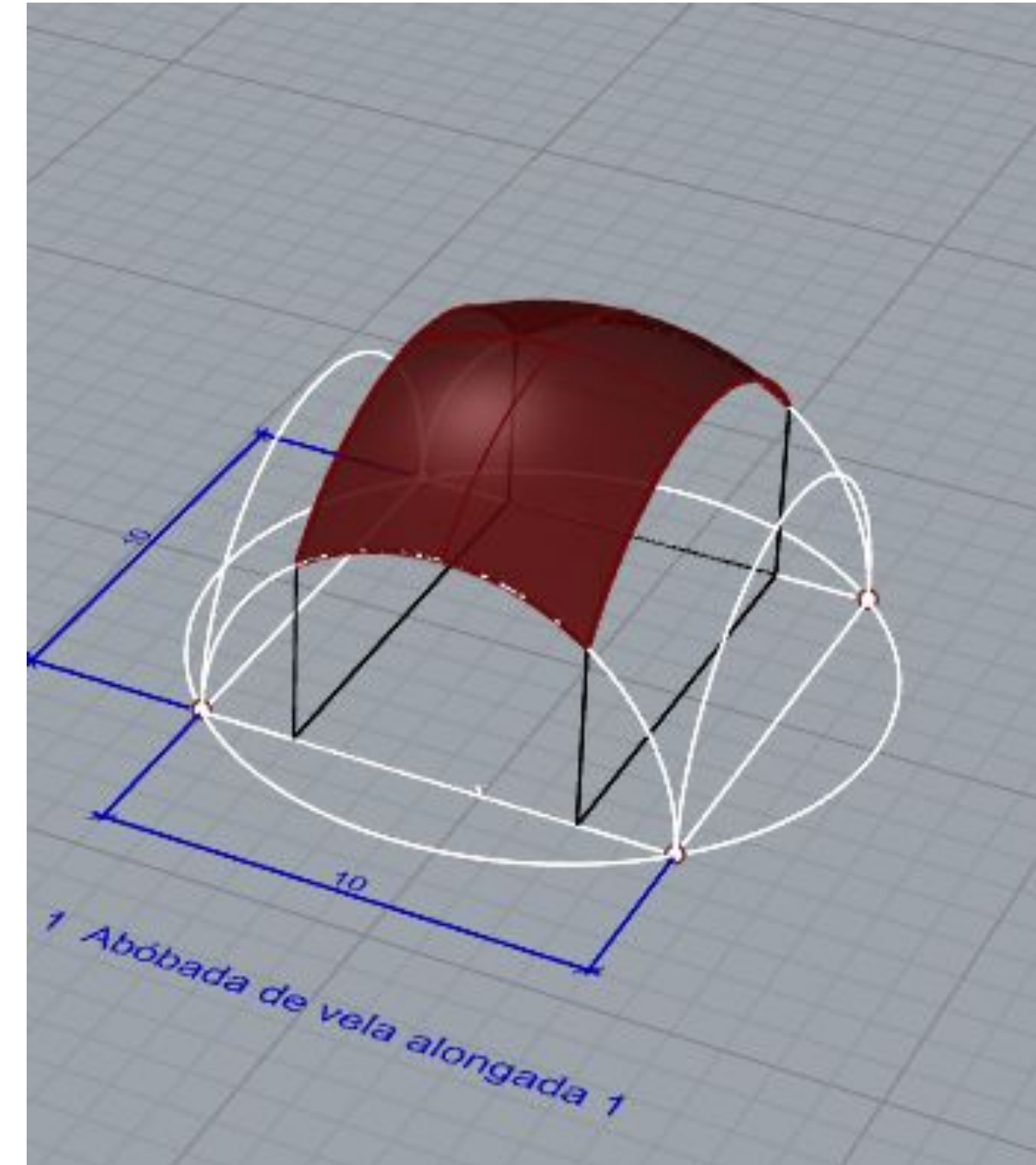
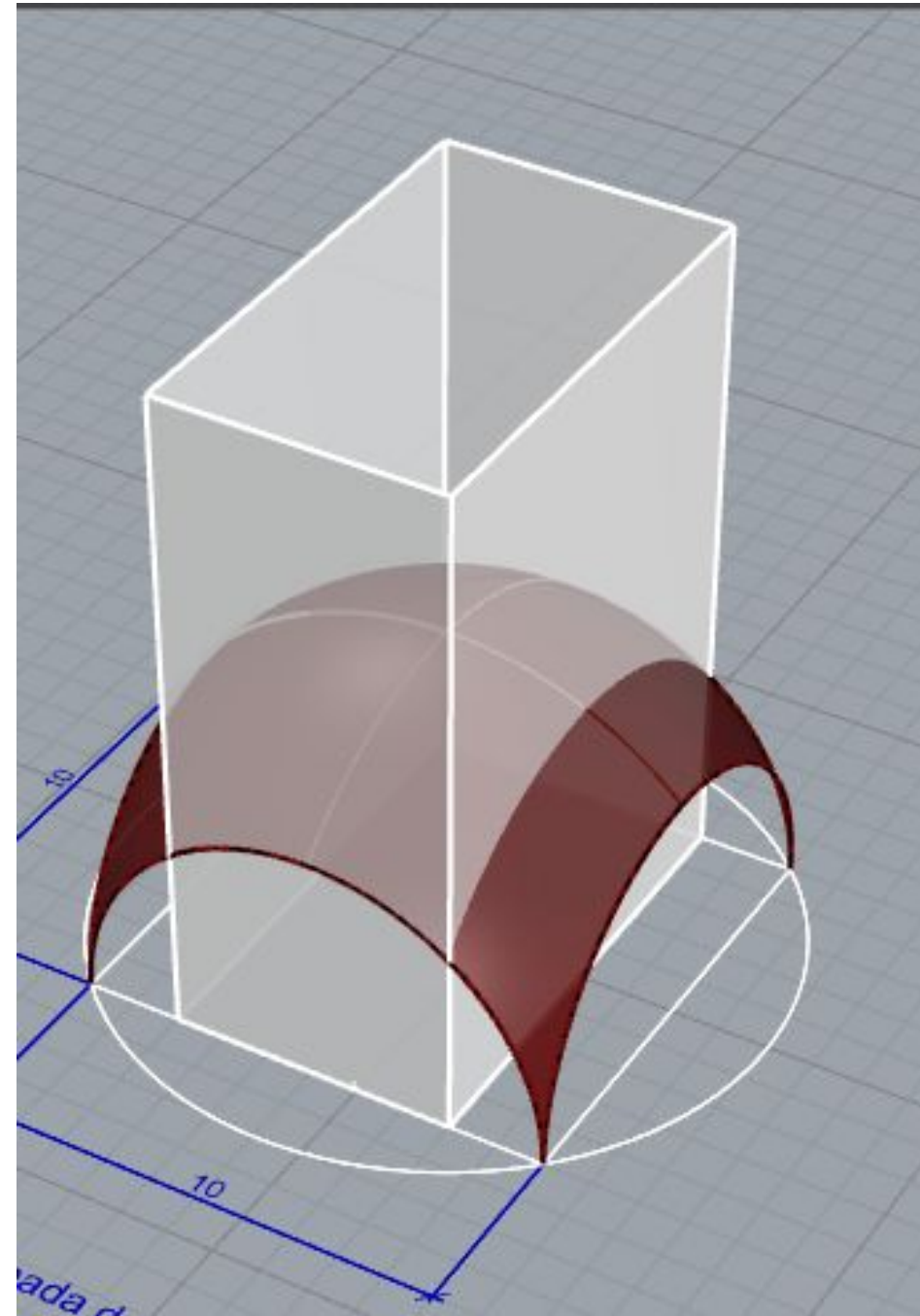
Abóbada catalã



ABOBADA CATALÃ

- quadrado com @10,10 e fazer a diagonal
- a partir do midpoint da diagonal, fazer uma line com @12<45<60 e fazer mirror, fazer linhas verticais que as ligam ao quadrado
- fazer mirror da estrutura
- fazer circunferência (arcos) no topo da estrutura e trim
- fazer uma esfera
- selecionar o quadrado, project, selecionar a esfera, enter, trim

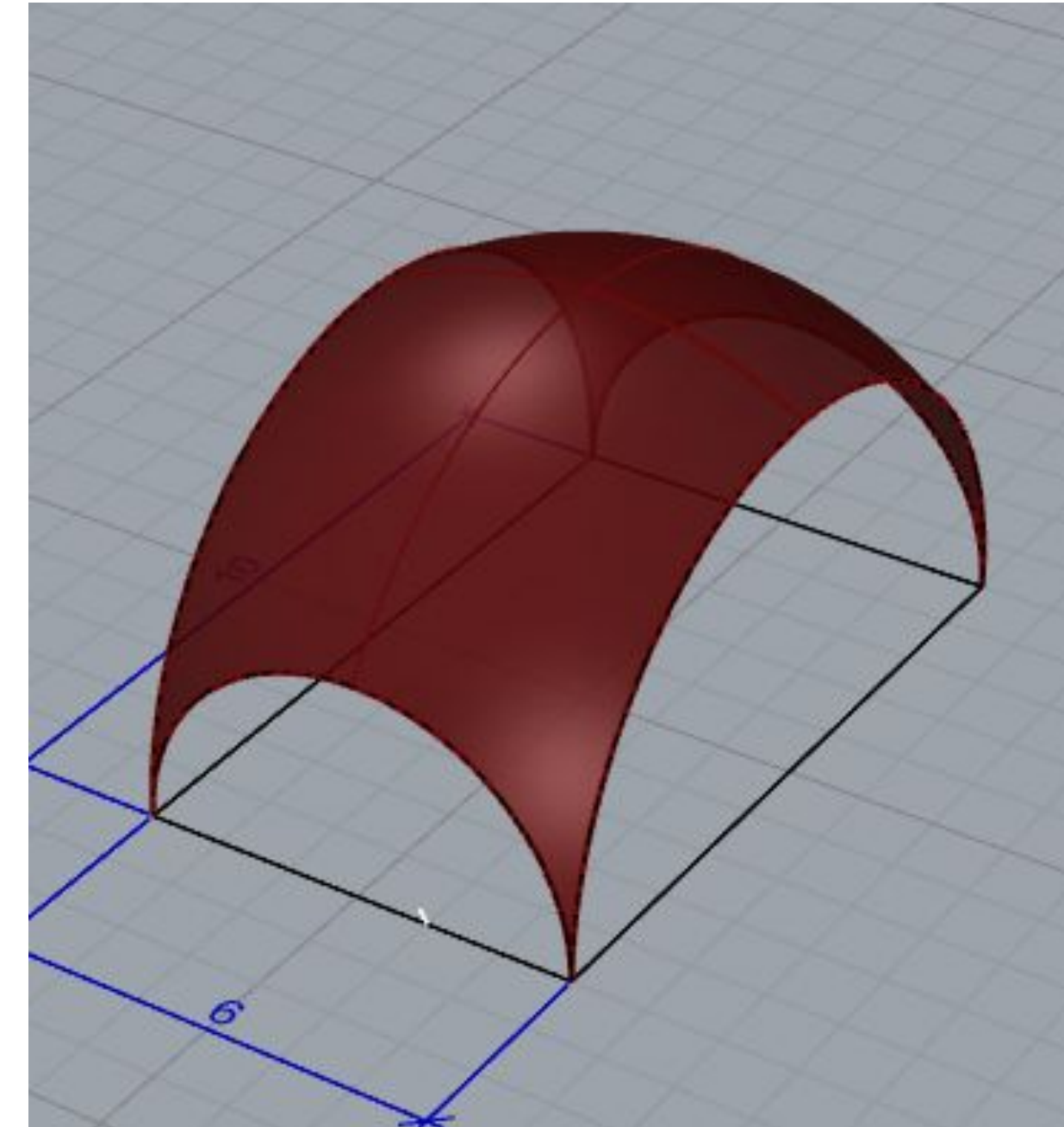
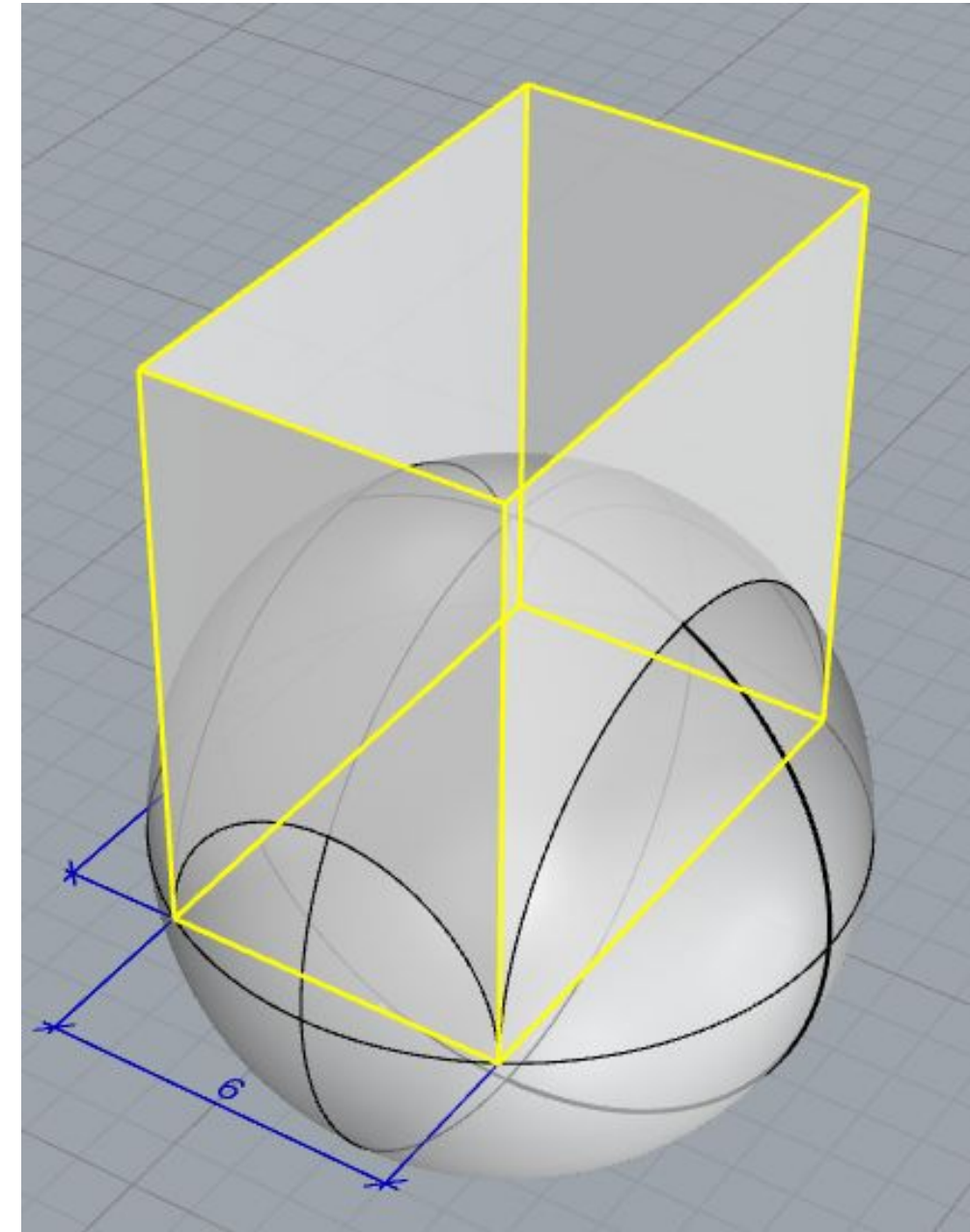
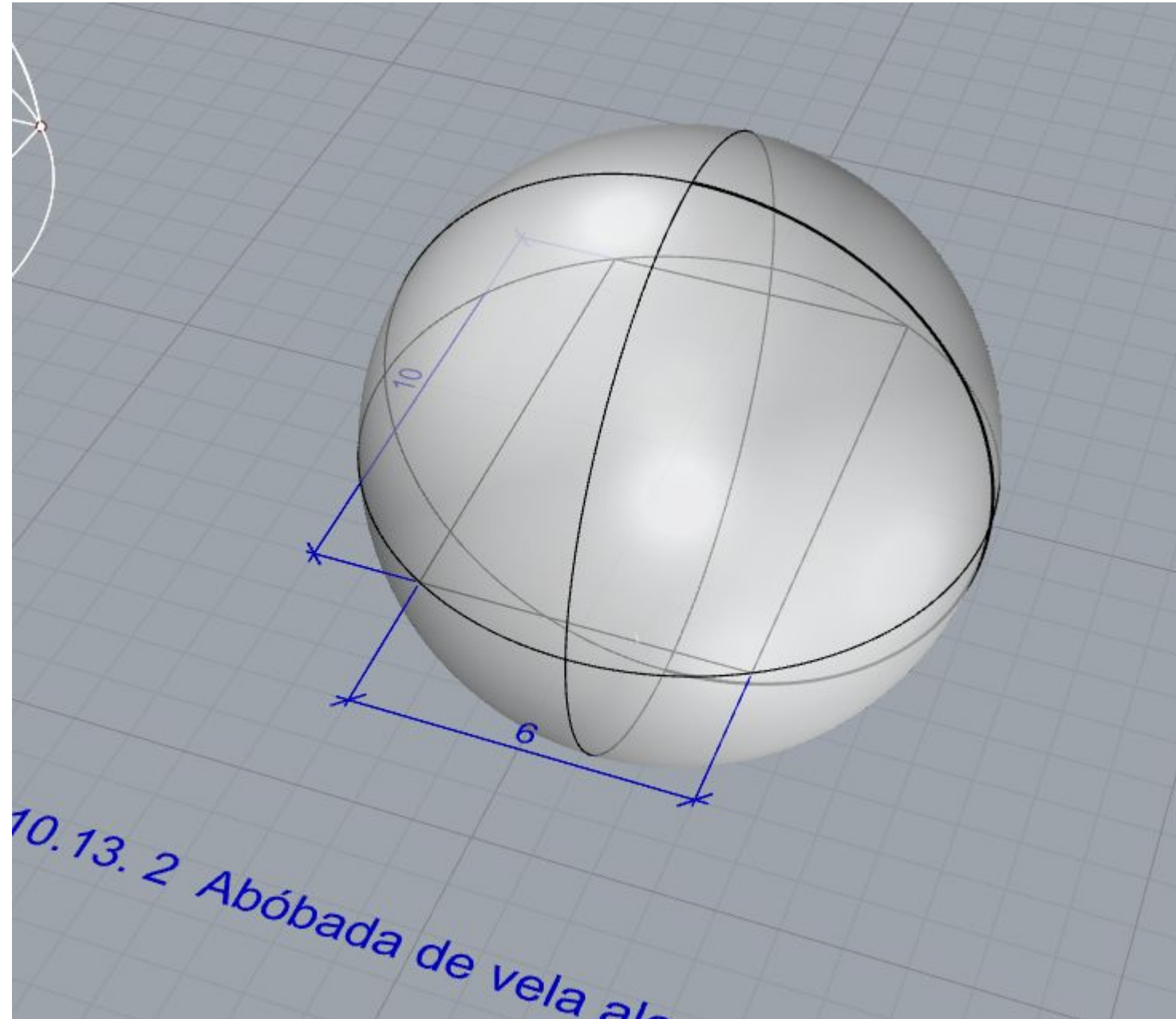
Abóbada de vela alongada 1



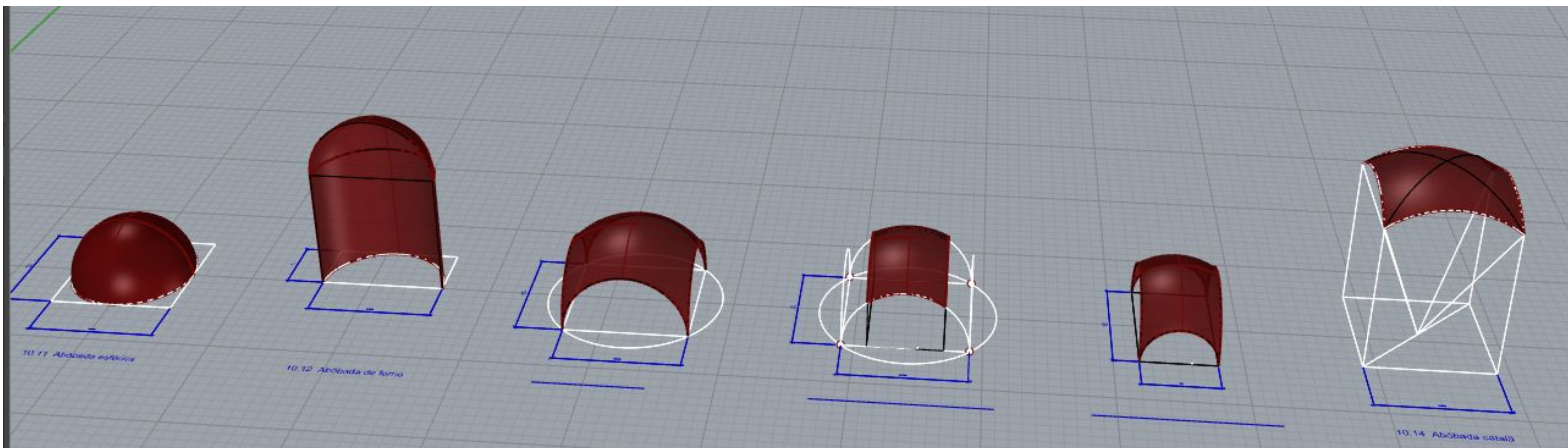
ABOBADA DE VELA ALONGADA 1

- copiar a abobada de vela e fazer no centro um retângulo com @6,10
- extrude do retângulo
- selecionar o retângulo, intersect, selecionar a abóbada
- trim

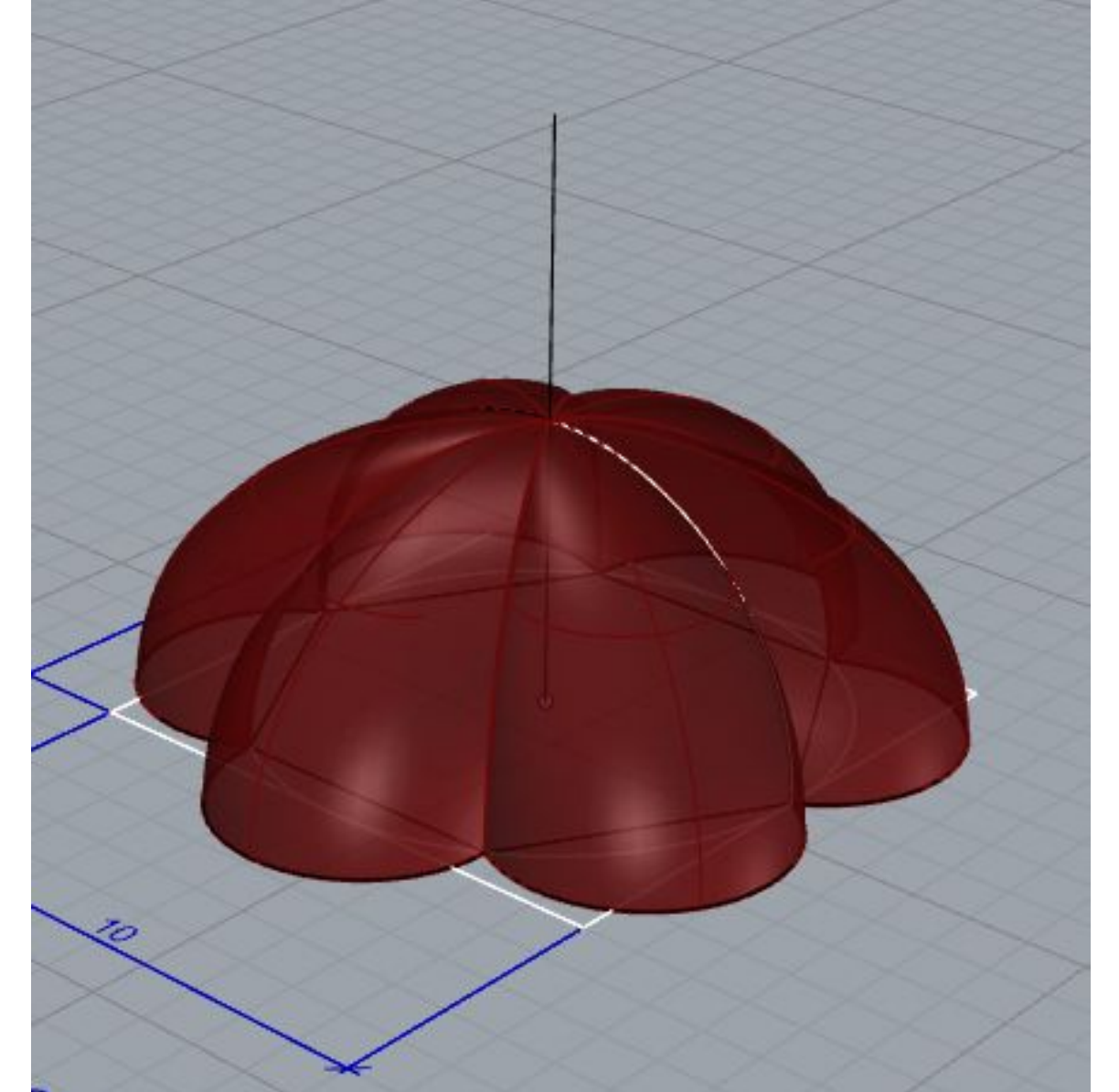
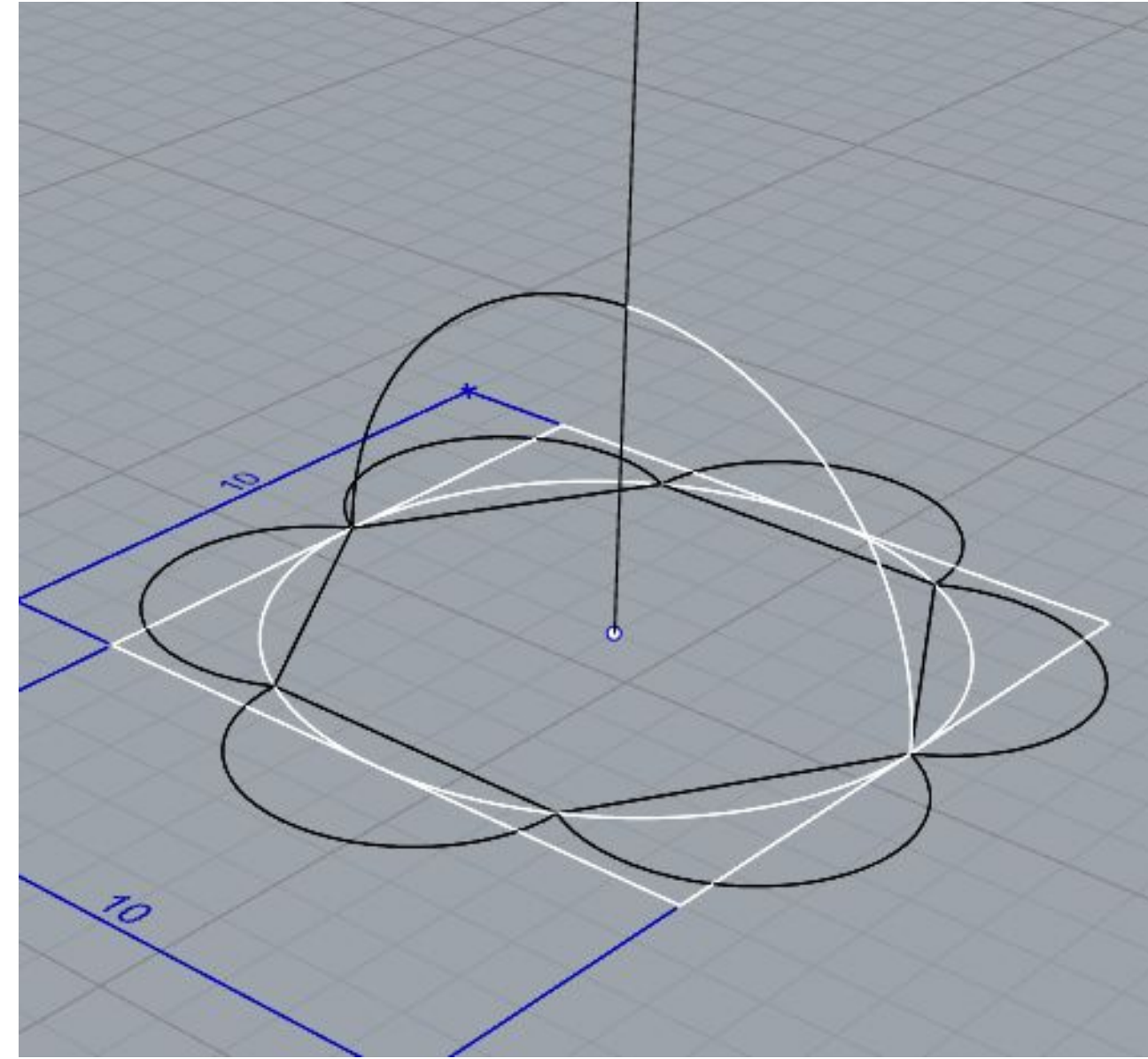
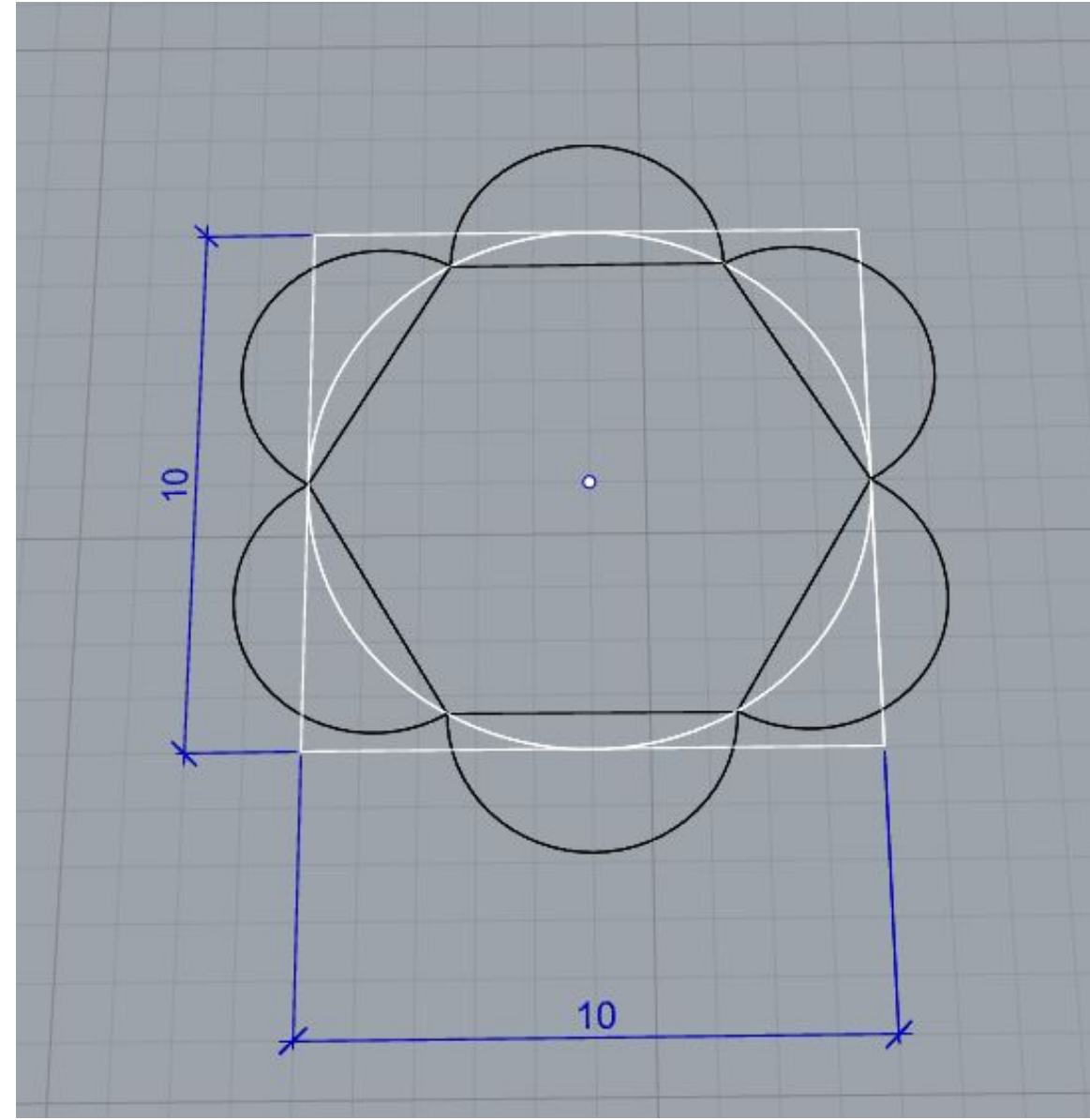
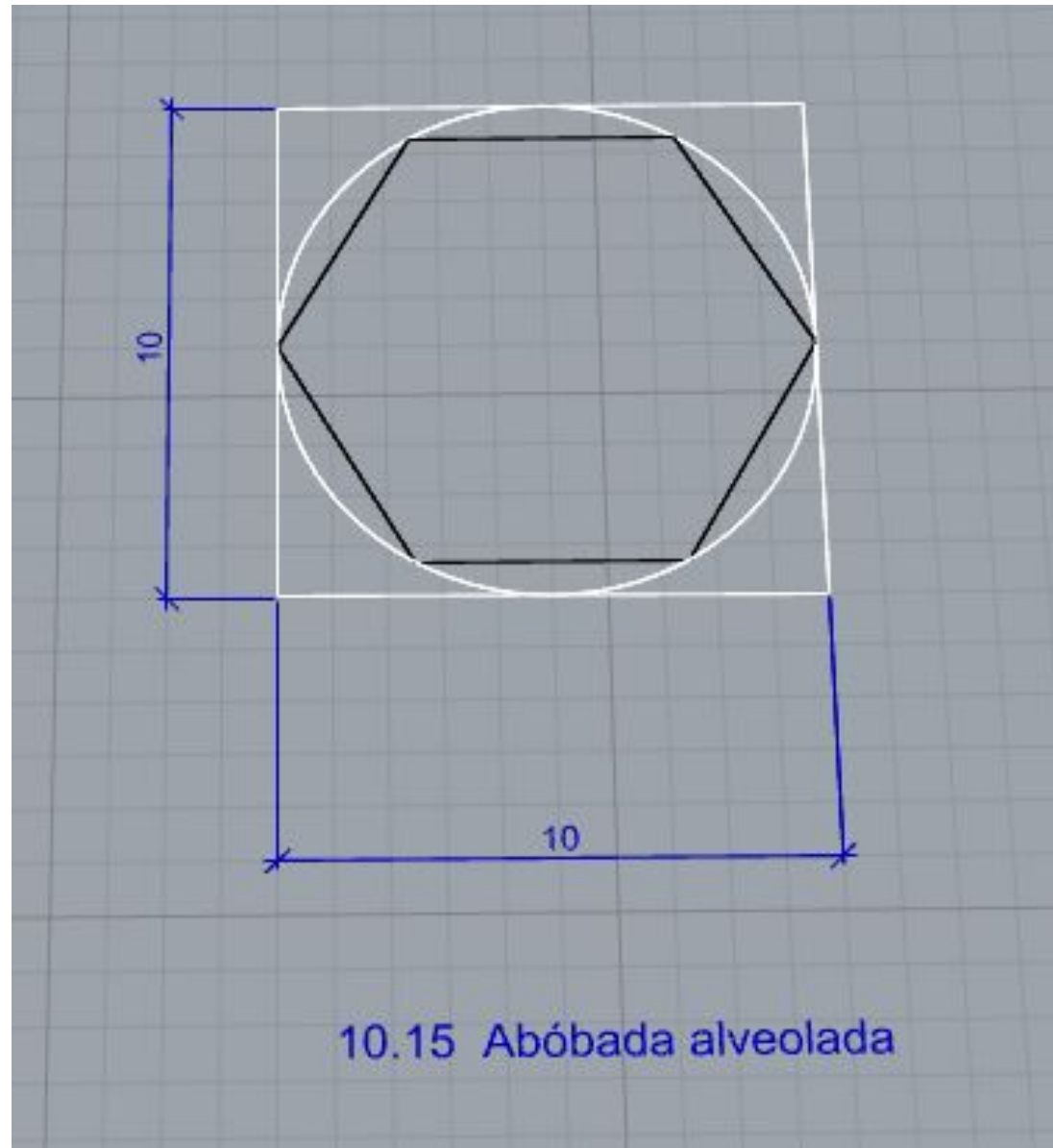
Abóbada de vela alongada 2



- ABOBADA DE VELA ALONGADA 2
- retângulo com @6,10
 - fazer uma esfera que toque nas arestas do retângulo
 - extrude do retângulo
 - intersect do retângulo com a esfera
 - trim



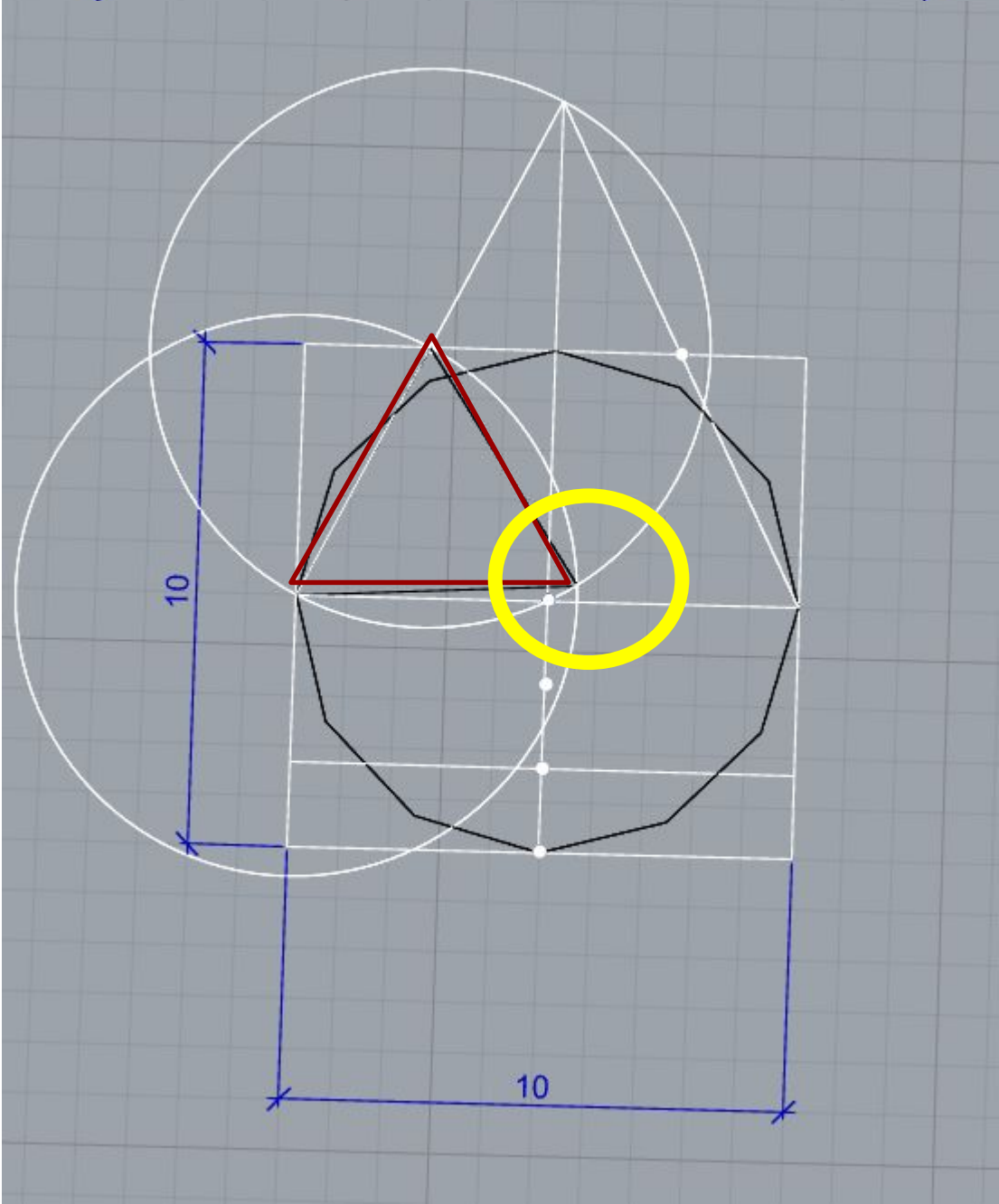
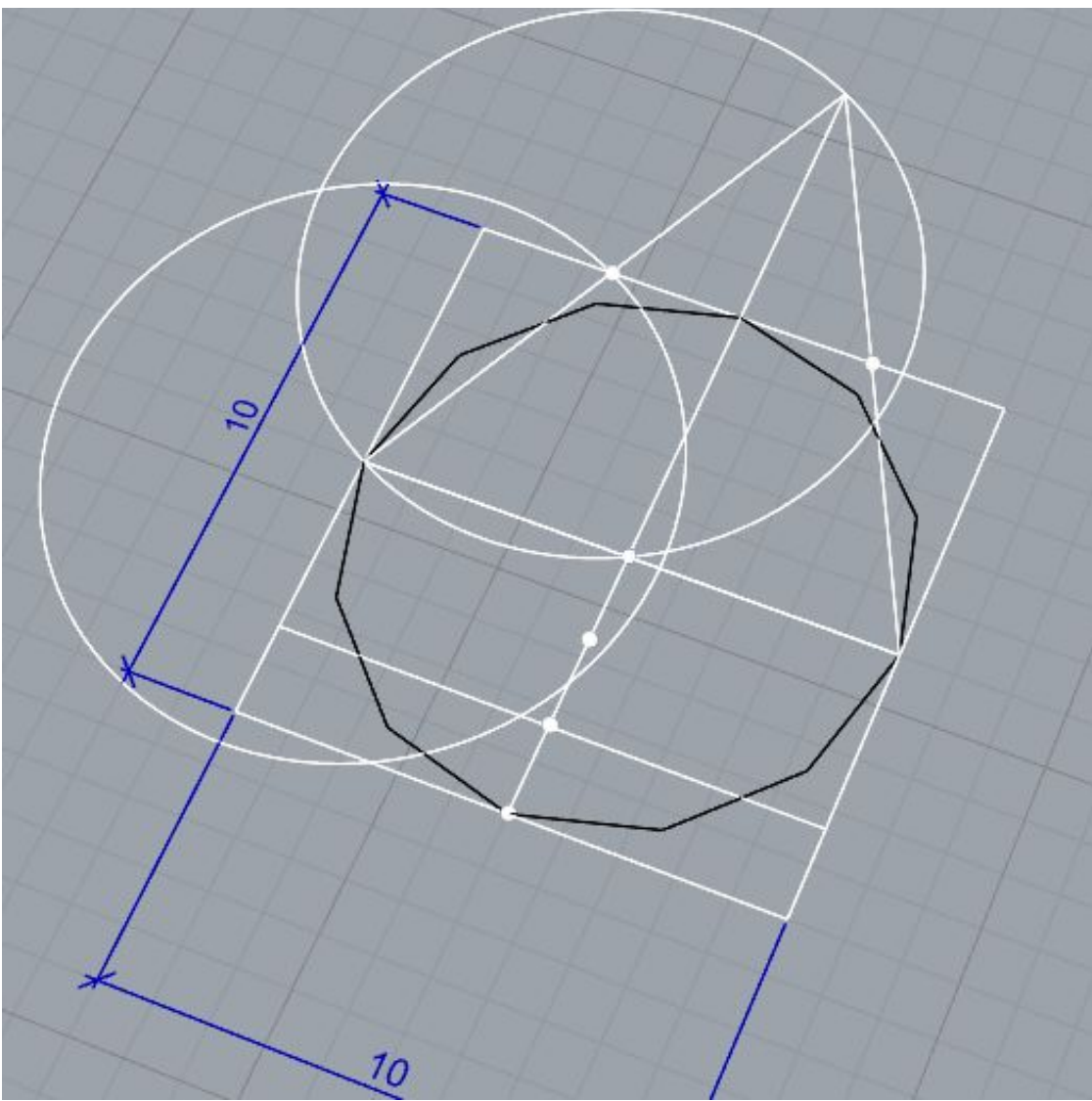
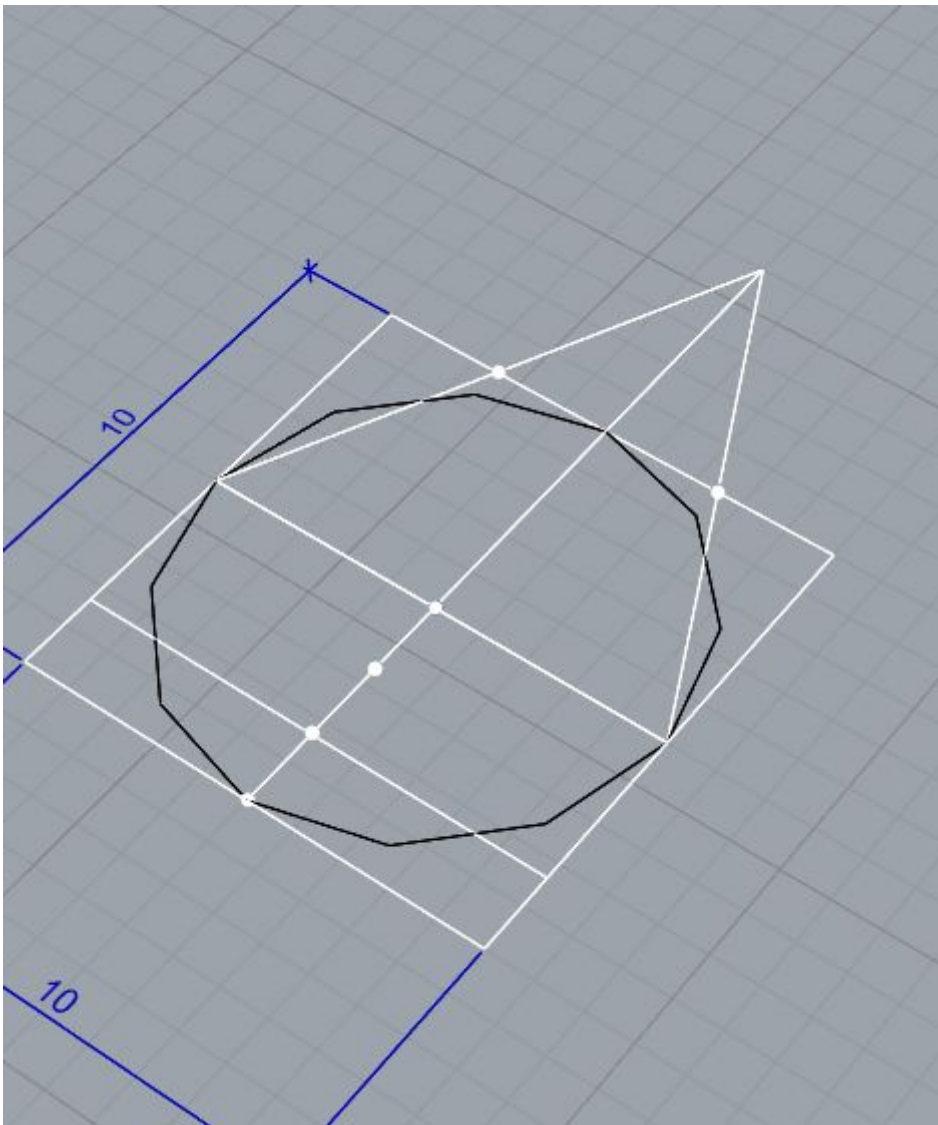
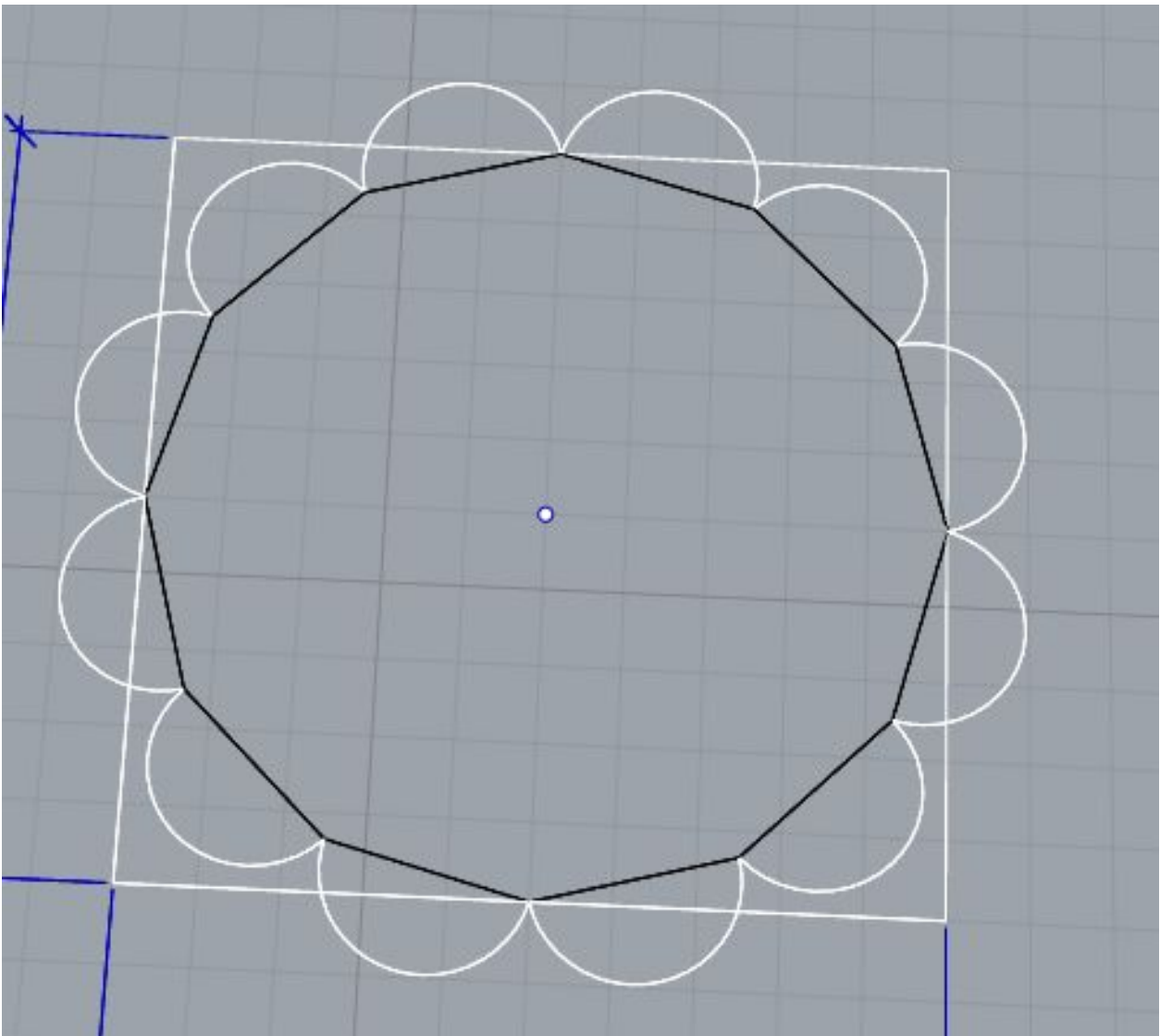
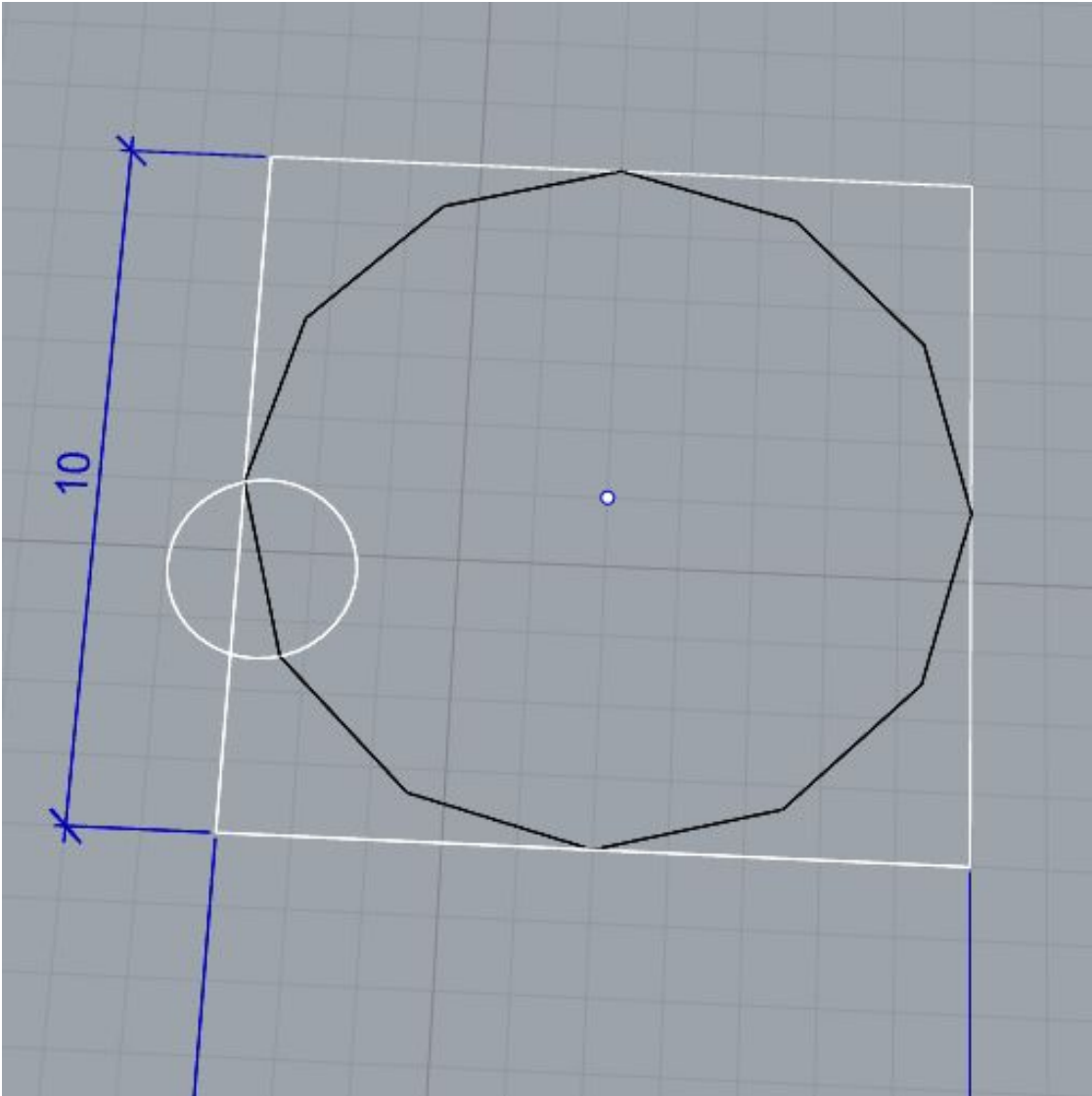
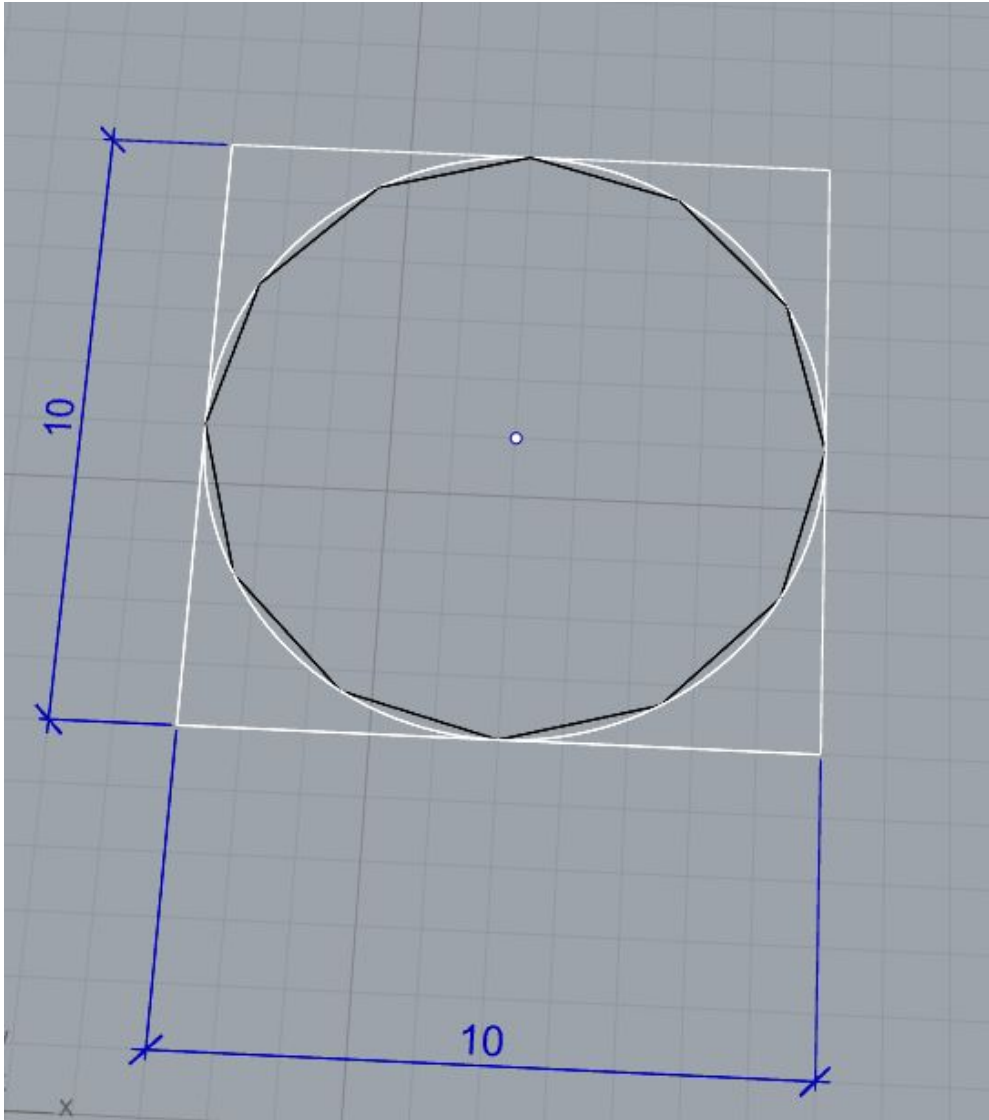
Abóbada alveolada



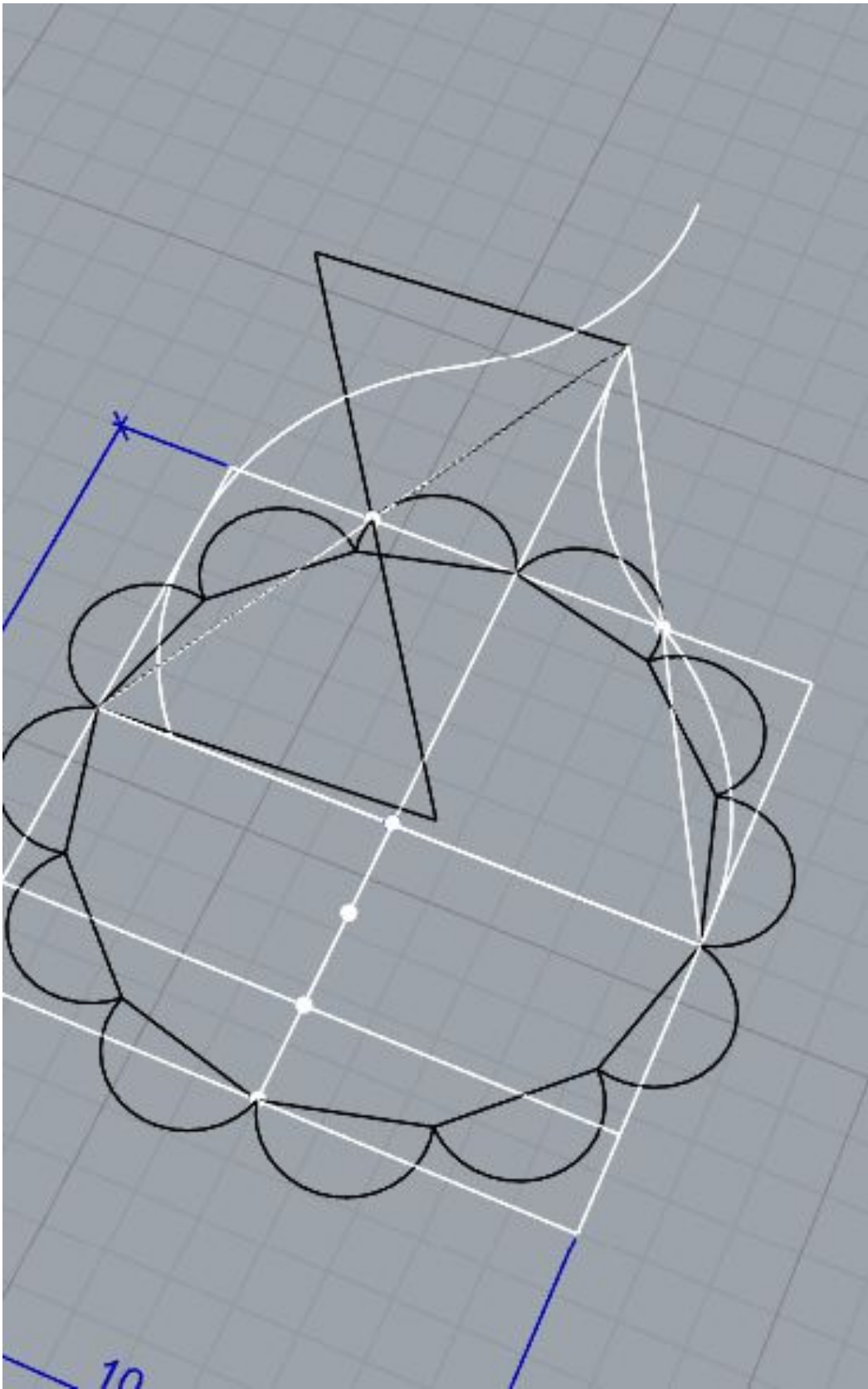
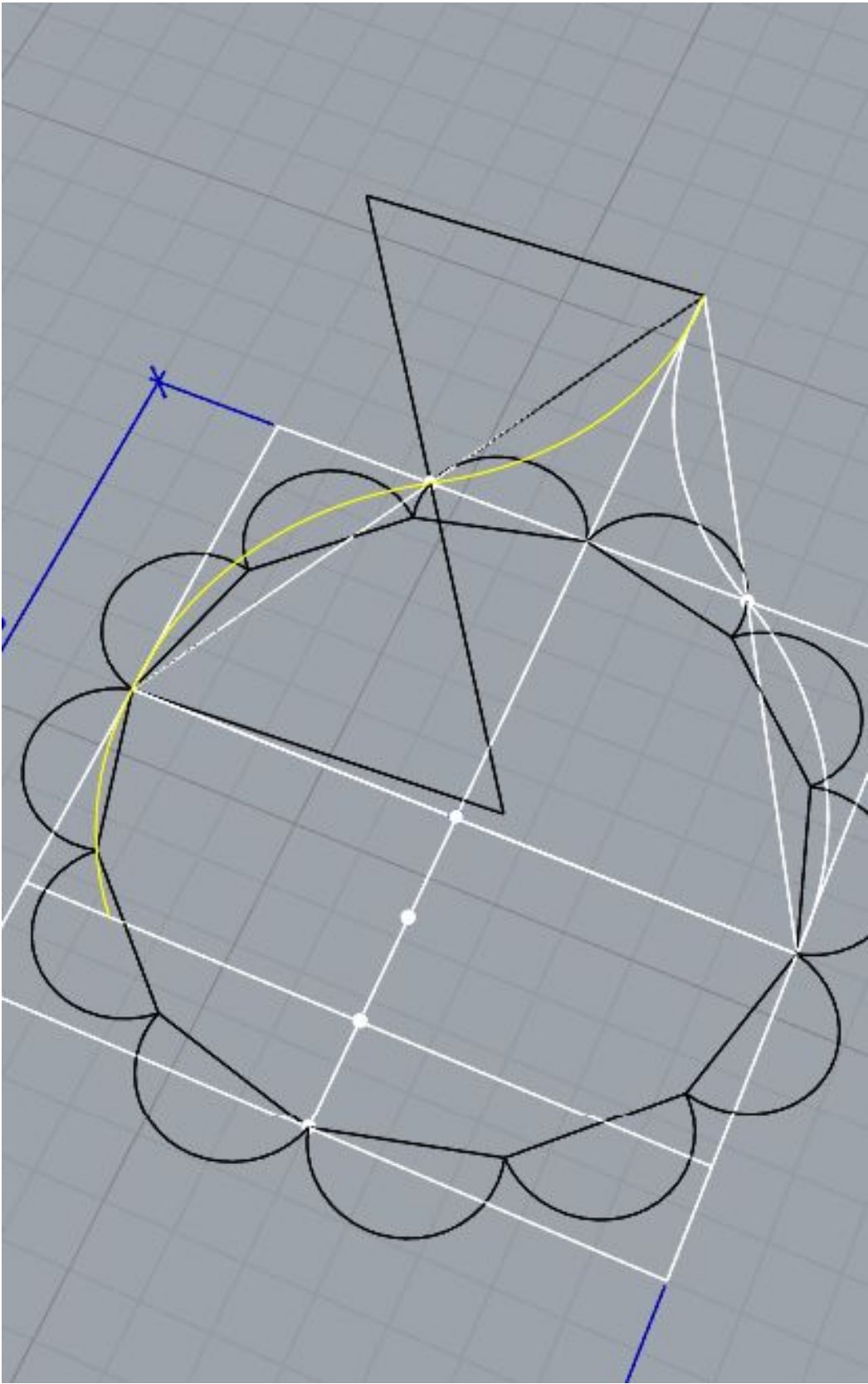
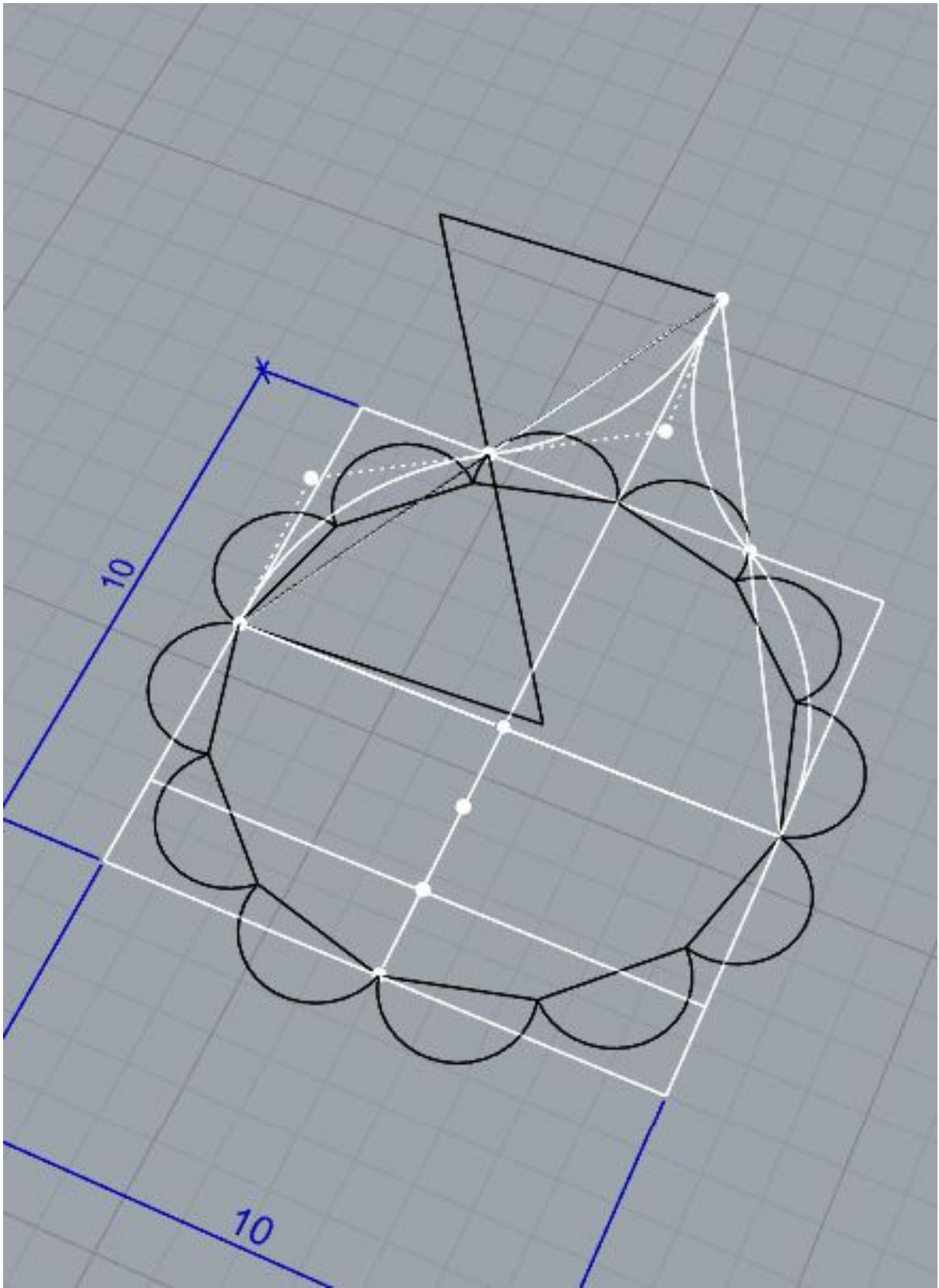
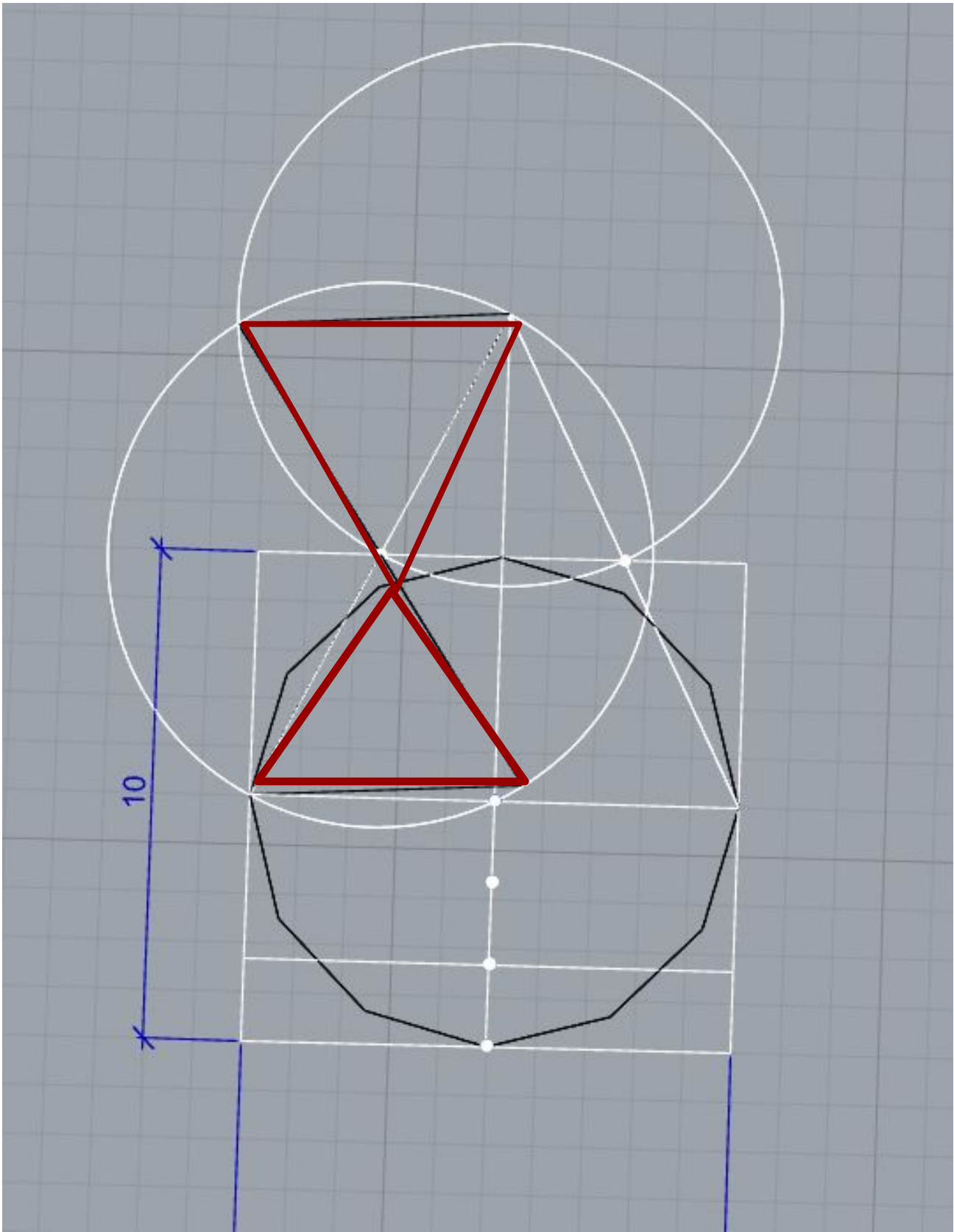
ABOBADA ALVEOLADA

- copiar a base da abóbada catalã
- fazer uma círculo dentro do quadrado
- polygon, 6lados, e fazer com pentágono
- numa das arestas fazer um arco, com centro no midpoint dessa aresta e até aos seus vértices
- marcar um ponto no centro do pentágono
- arraypolar, seleccionar o arco, seleccionar o ponto no centro do pentágono, 6 cópias, 360°, enter
- agrupar todos os arcos
- fazer uma line vertical no centro do pentágono com 10 de altura
- fazer uma circunferência vertical com 2 pontos apartir dos vértices laterais no pentágono, trim da parte de baixo do círculo
- split, seleccionar o arco, enter, seleccionar a linha com 10 vertical enter, (o arco fica dividido a partir da linha vertical)
- railrevolve, seleccionar a parte esq. do arco cortado, seleccionar os 6 arcos agrupados e em seguida seleccionar a linha vertical a começar pelo ponto de baixo até ao de cima, enter

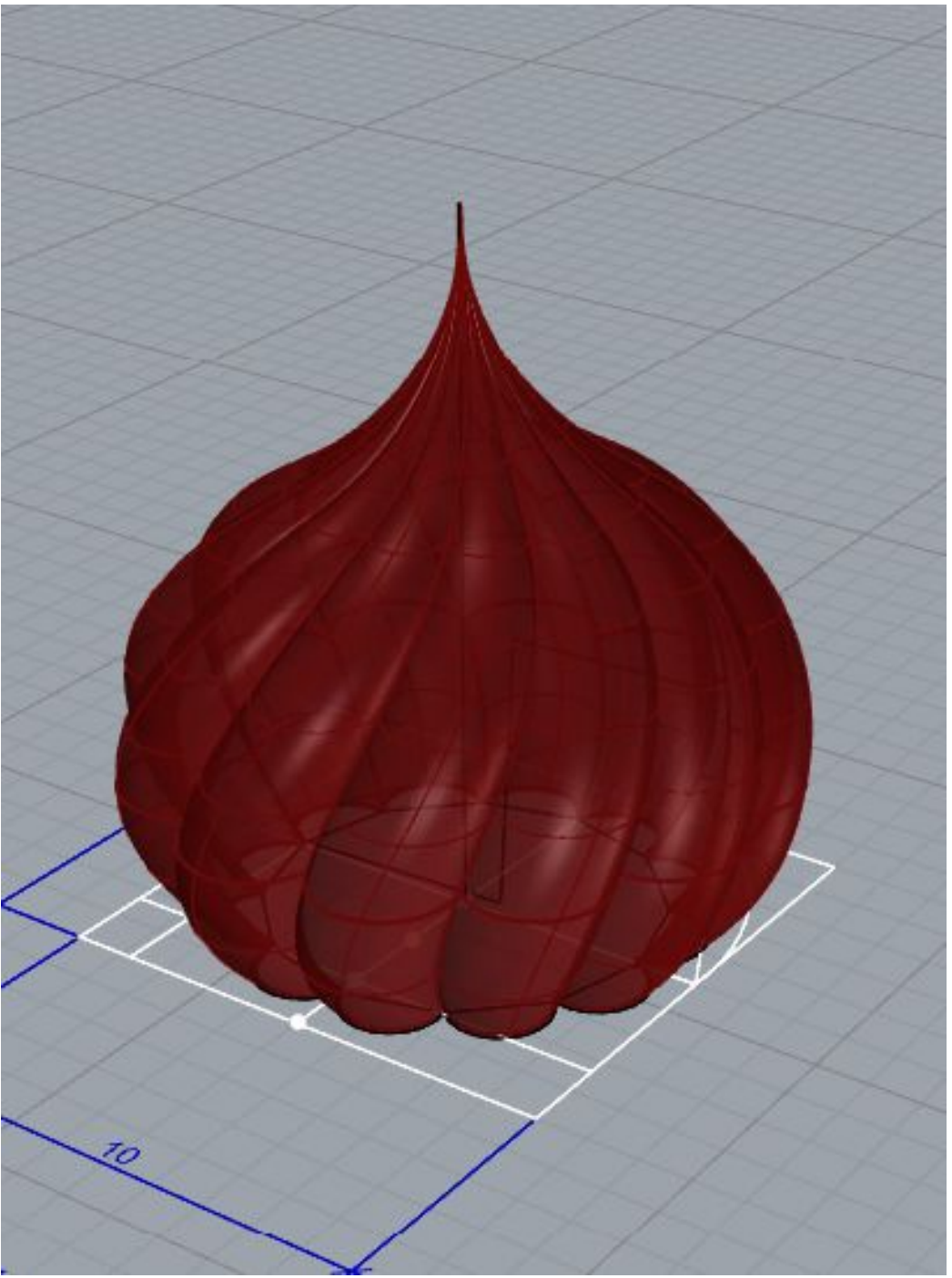
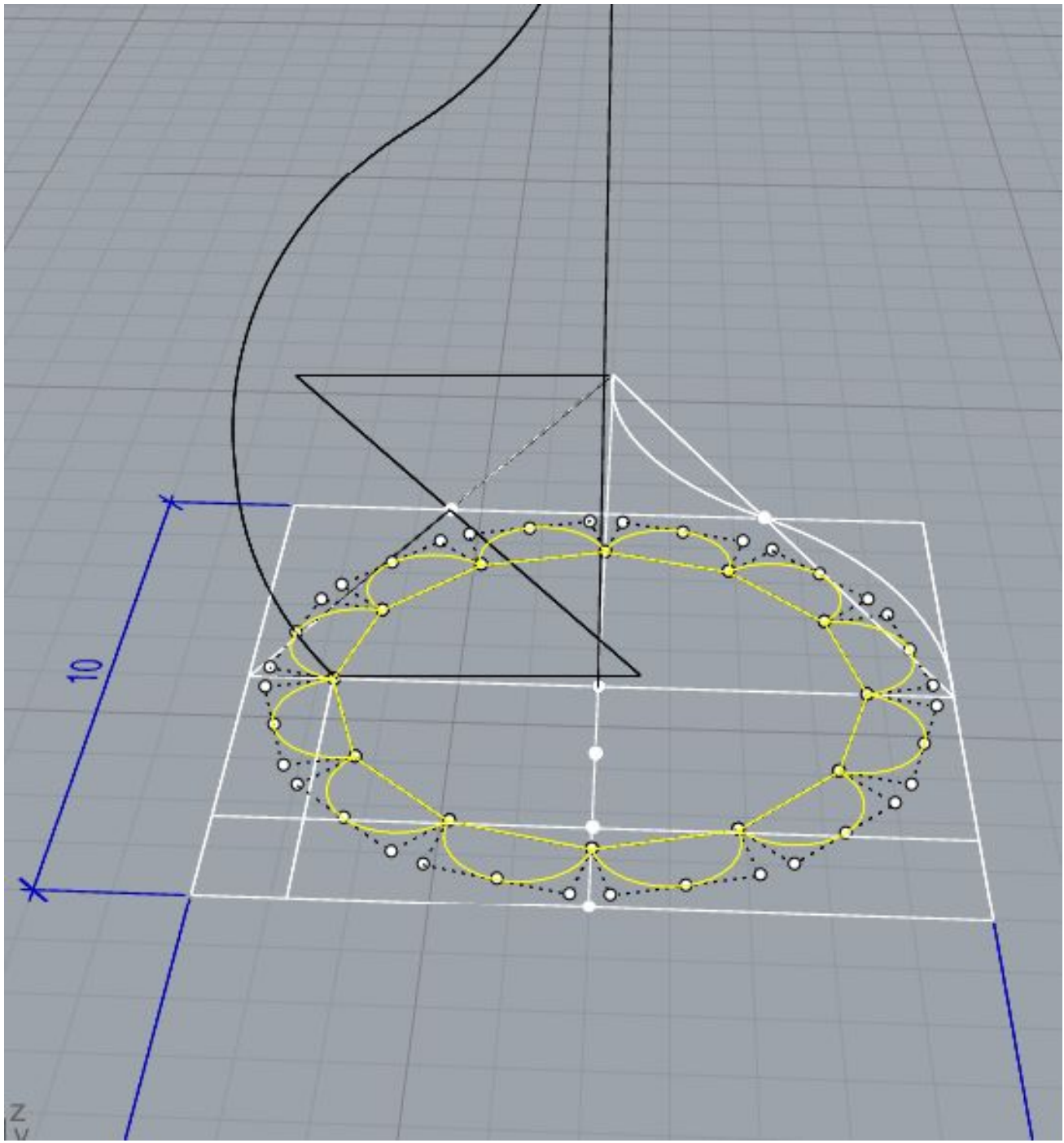
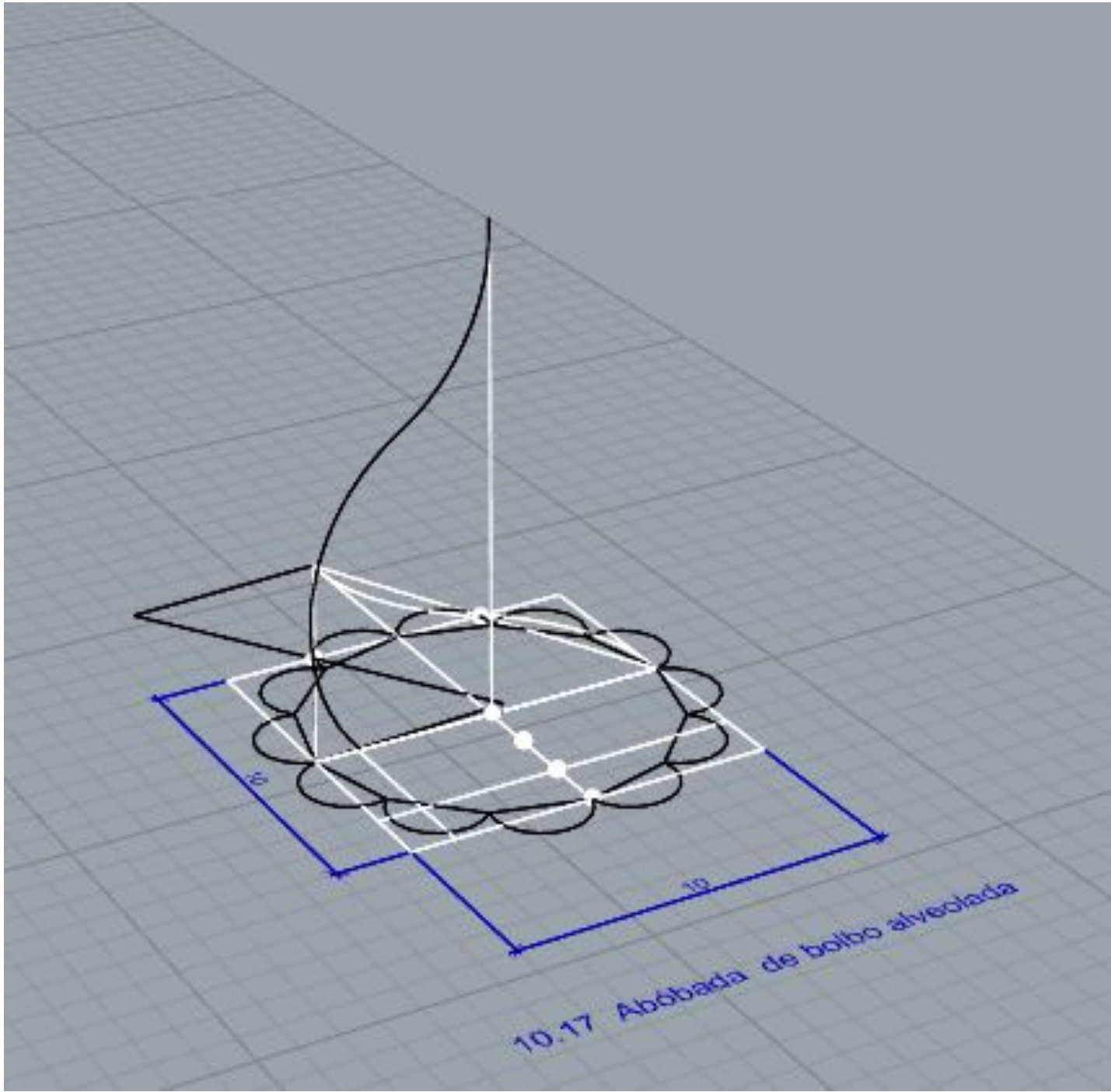
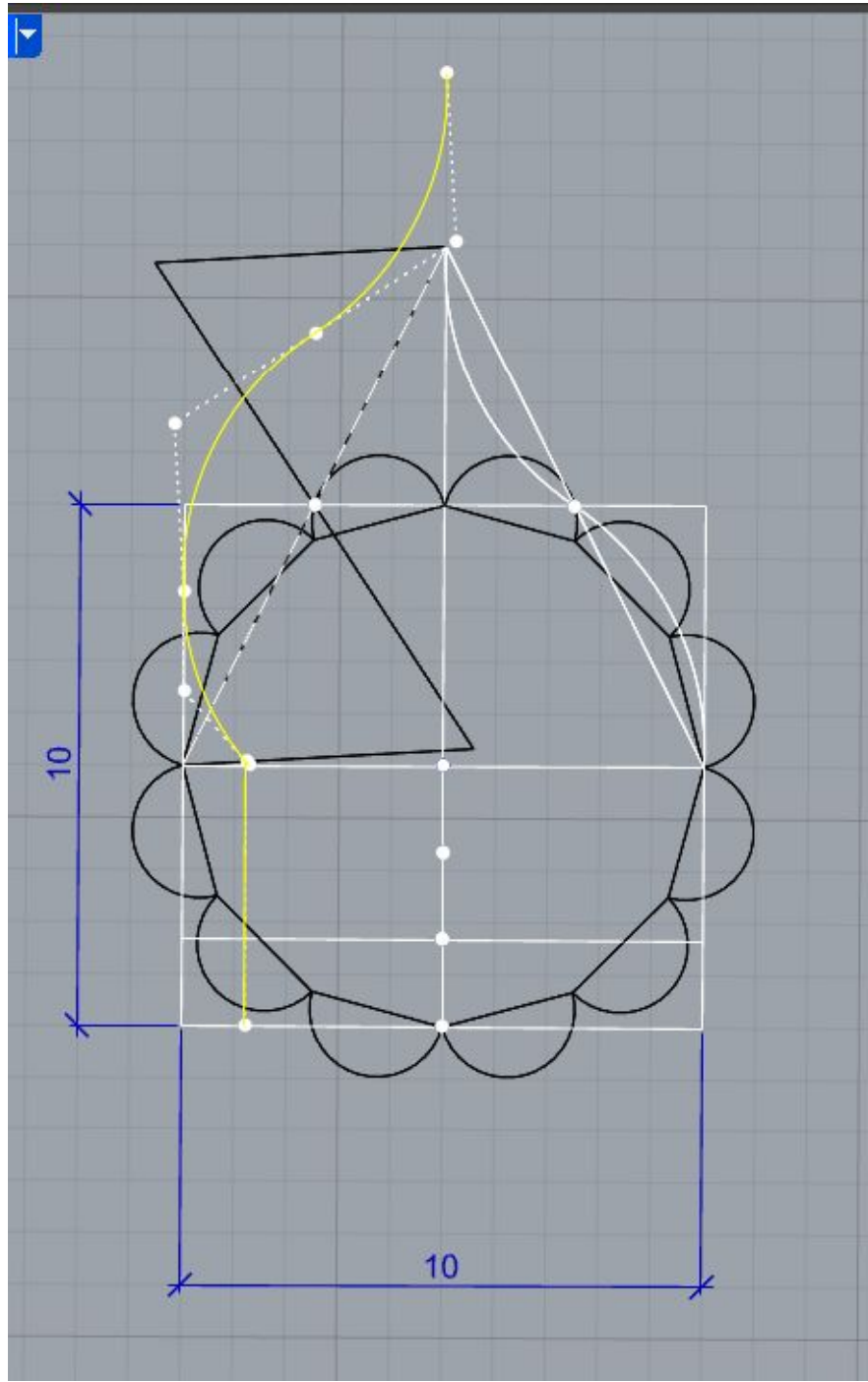
Abóbada de bolbo alveolada



Abóbada de bolbo alveolada



Abóbada de bolbo alveolada



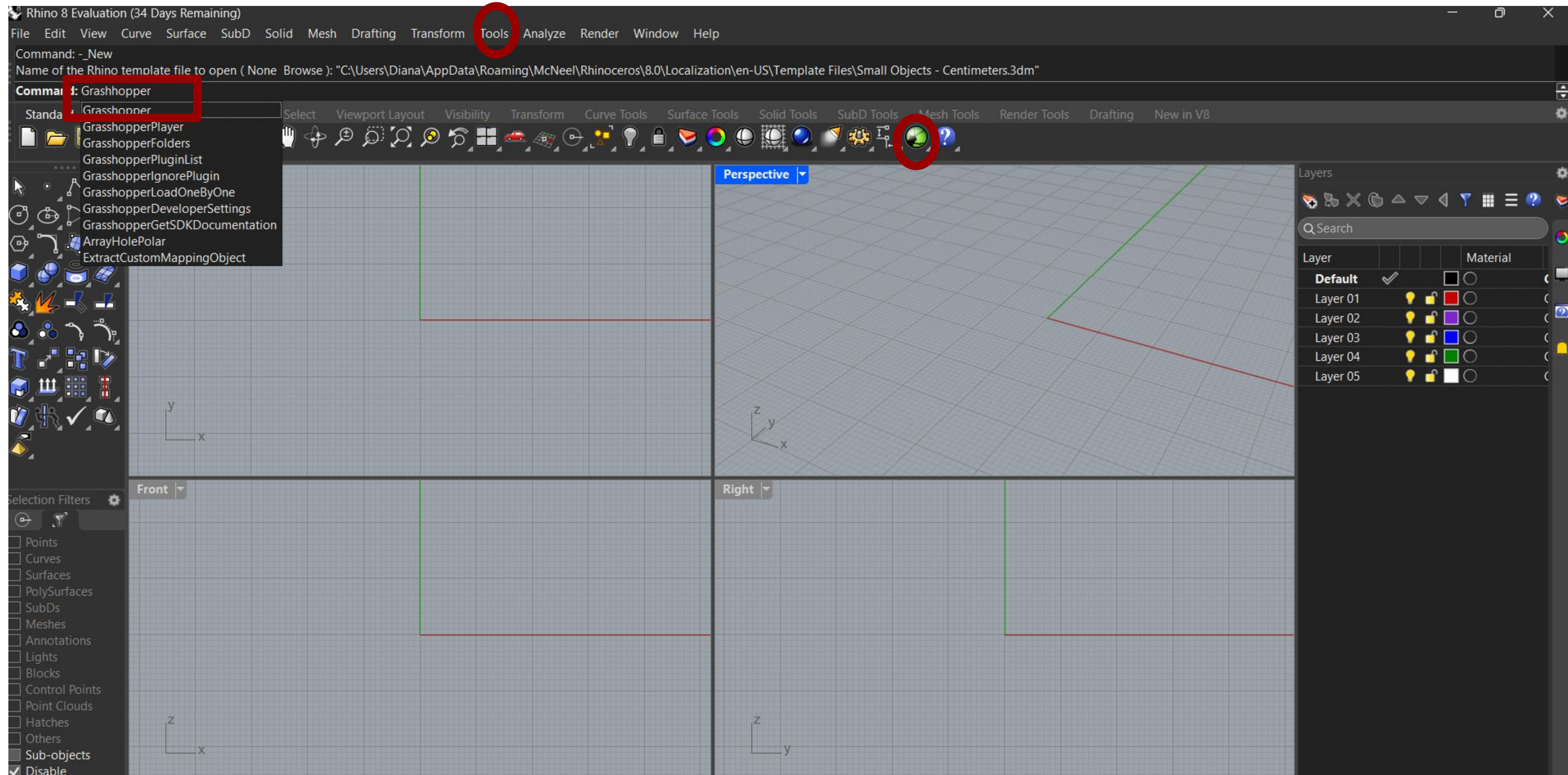
Abóbada de bolbo alveolada

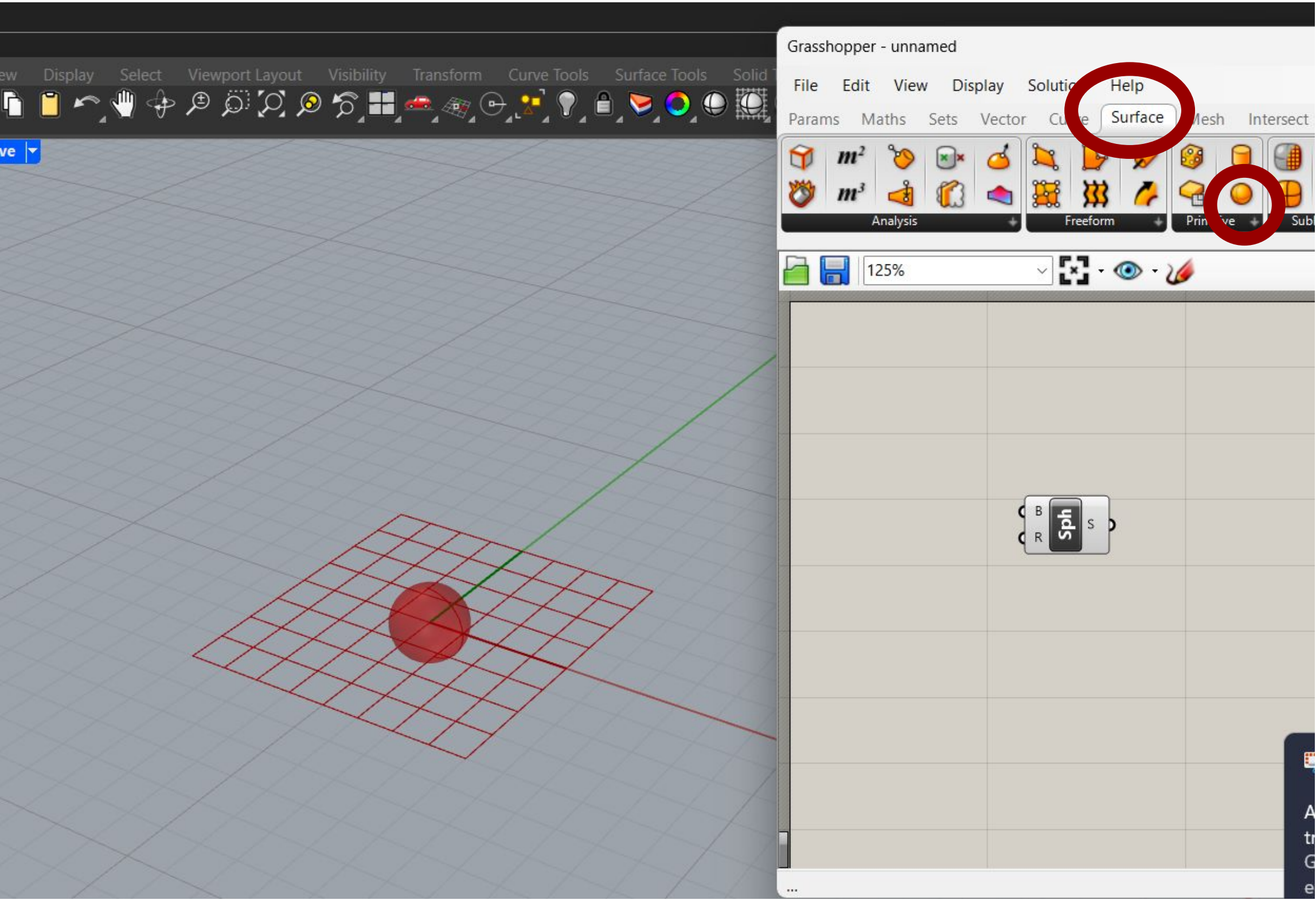
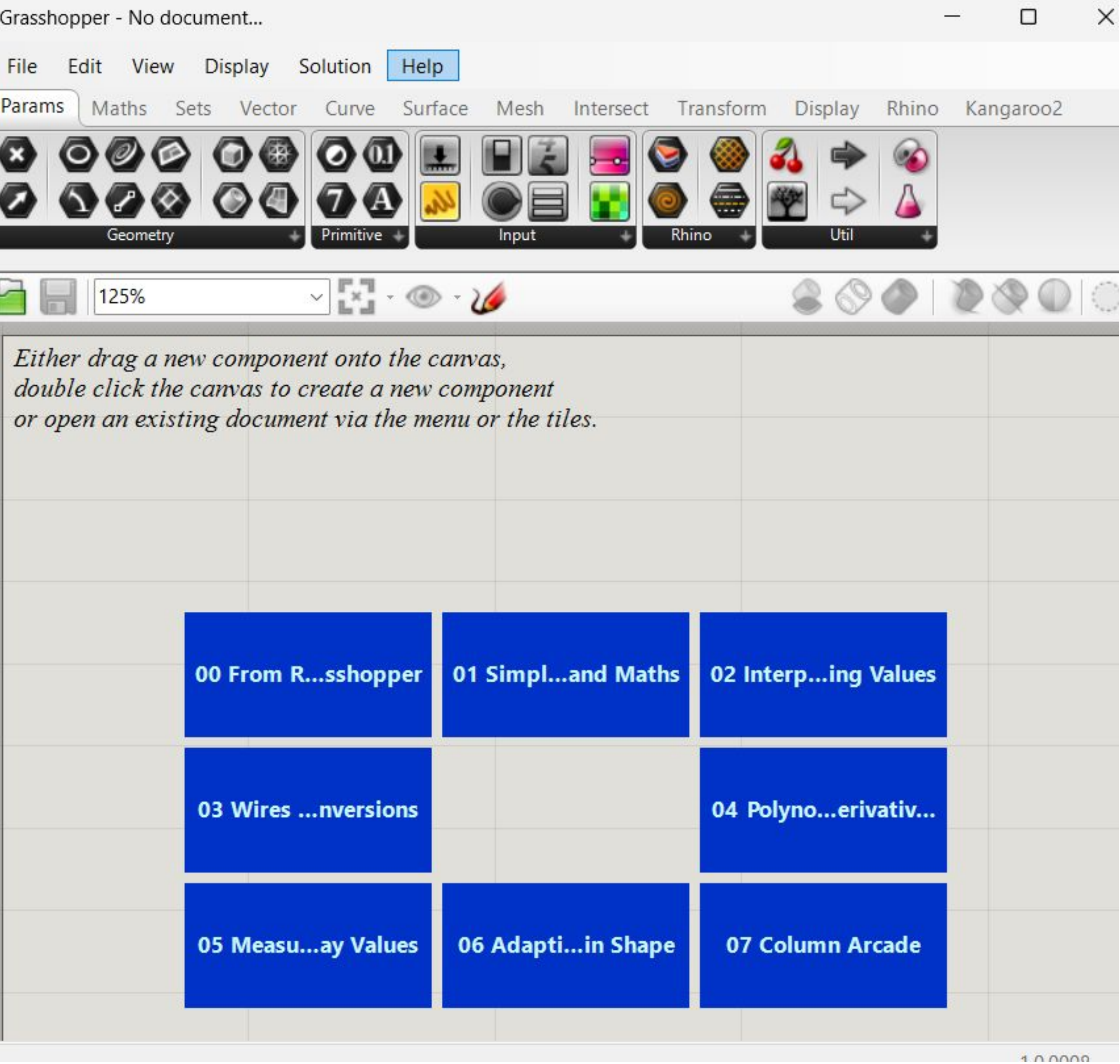
ABÓBADA DE BOLBO ALVEOLADA

- copiar a base da abóbada anterior (quadrado + círculo interior)
- polygon, 12lados e podemos apagar a circunferência inicial para não ser confuso
- fazer um círculo com 2 pontos em uma das arestas no polígono, e trim a da parte do círculo que fica dentro do polígono
- arraypolar da semi-circunferência, com centro no centro do polígono, 12 vezes, 360º
- agrupar todos os arcos
- fazer uma line que passe no diâmetro do polígono
- desativar a camada dos arcos
- fazer uma linha do centro do polígono com 10cm
- fazer a metade da linha para baixo
- selecionar a linha de baixo, "divide", 3, enter
- fazer line que passe pelo ponto mais abaixo
- fazer 2 lines que unem a linha do diâmetro do polígono até ao ponto superior da line com 10cm
- identificar o midpoint das últimas linhas (triângulo)
- fazer um círculo com centro lado esq. da linha do diâmetro do polígono com raio até ao midpoint criado no triângulo
- fazer outro círculo com centro no midpoint anterior até ao vértice do "triângulo"
- marcar, com uma polyline, o triângulo concebido, através dos círculos
- apagar o círculo inferior, e fazer outro círculo com centro no vértice do "triângulo da linha de 10cm, e raio até ao topo do triângulo concebido através dos 2 círculos anteriores
- marcar o triângulo 2 concebido através destes dois círculos
- podemos apagar os círculos
- fazer arcos nas laterais dos triângulos
- agrupados os dois segmentos (arcos)
- mirror, do segmento, do ponto superior ao ponto de baixo do polígono inicial
- fazer um círculo do centro do polígono até à sua aresta
- trim da parte de cima do círculo e trim da parte de baixo apartir daquela linha (dos 3 pontos que tínhamos feito)
- agrupar
- move desse segmento na perpendicular
- line perpendicular no fim do segmento até ao quadrado inicial
- line do centro do polígono até ao topo do segmento
- rotate3d, selecionar o segmento e a linha que o une até ao centro do polígono, enter, selecionar o centro do polígono até ao seu raio do lado dir
- scale, selecionar os 12 arcos, selecionar o polígono, enter, selecionar o ponto do centro do polígono até ao seu raio, e escala-lo até ao ponto do segmento
- twist, selecionar o segmento, enter selecionar os pontos do eixo vertical, 45º
- railrevolve, selecionar o segmento, os 12 arcos, e a linha do eixo vertical

GRASSHOPPER

- grasshopper





GRASSHOPPER
surface , primitive; esfera



01 Radius (R)

Sphere radius

One locally defined value...

4

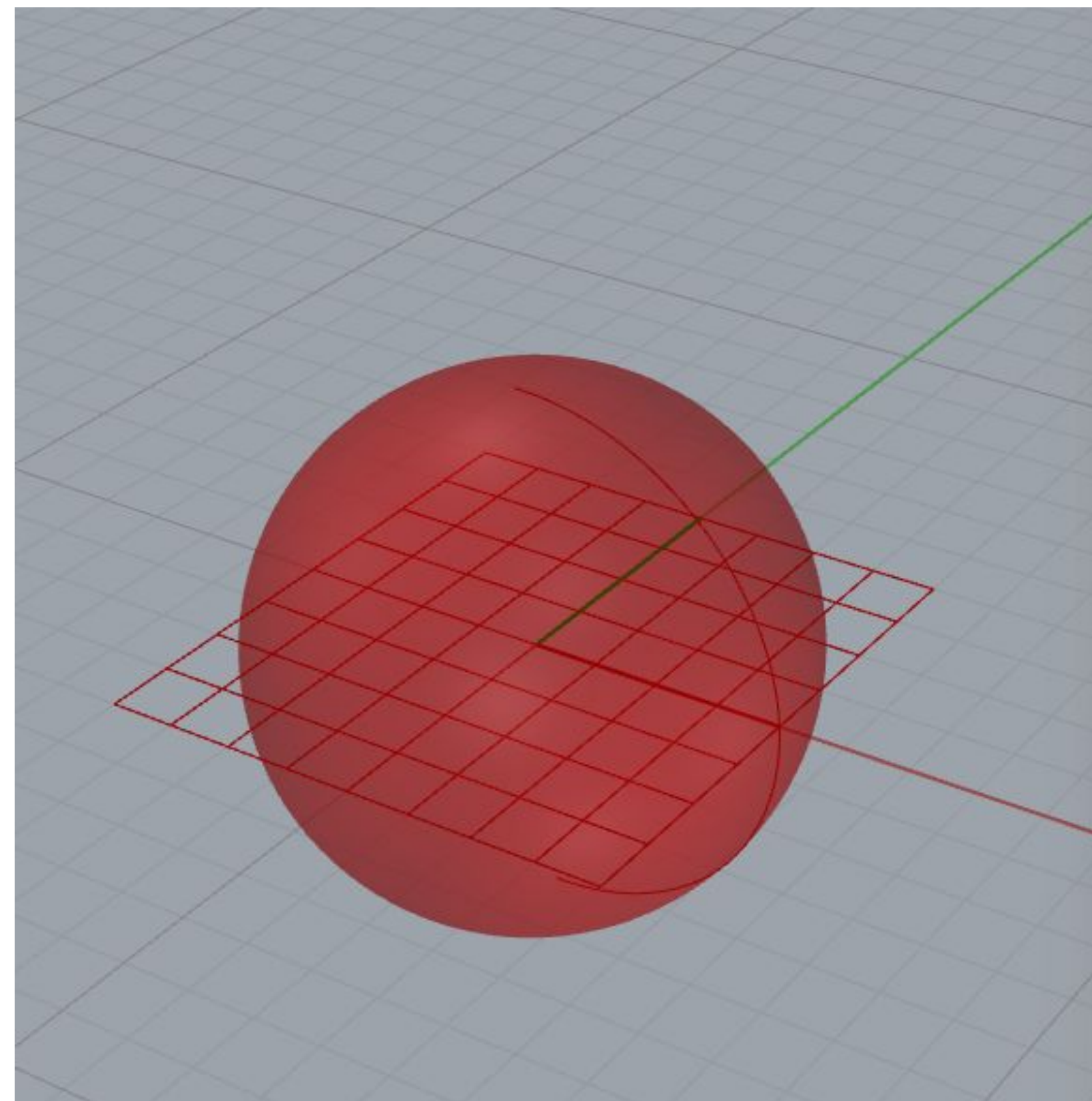


- R
- Wire Display
- Principal
- Reverse
- Flatten
- Graft
- Simplify
- Expression
- Set Number
- Set Multiple Numbers
- Manage Number collection
- Clear values
- Internalise data
- Extract parameter
- Help...

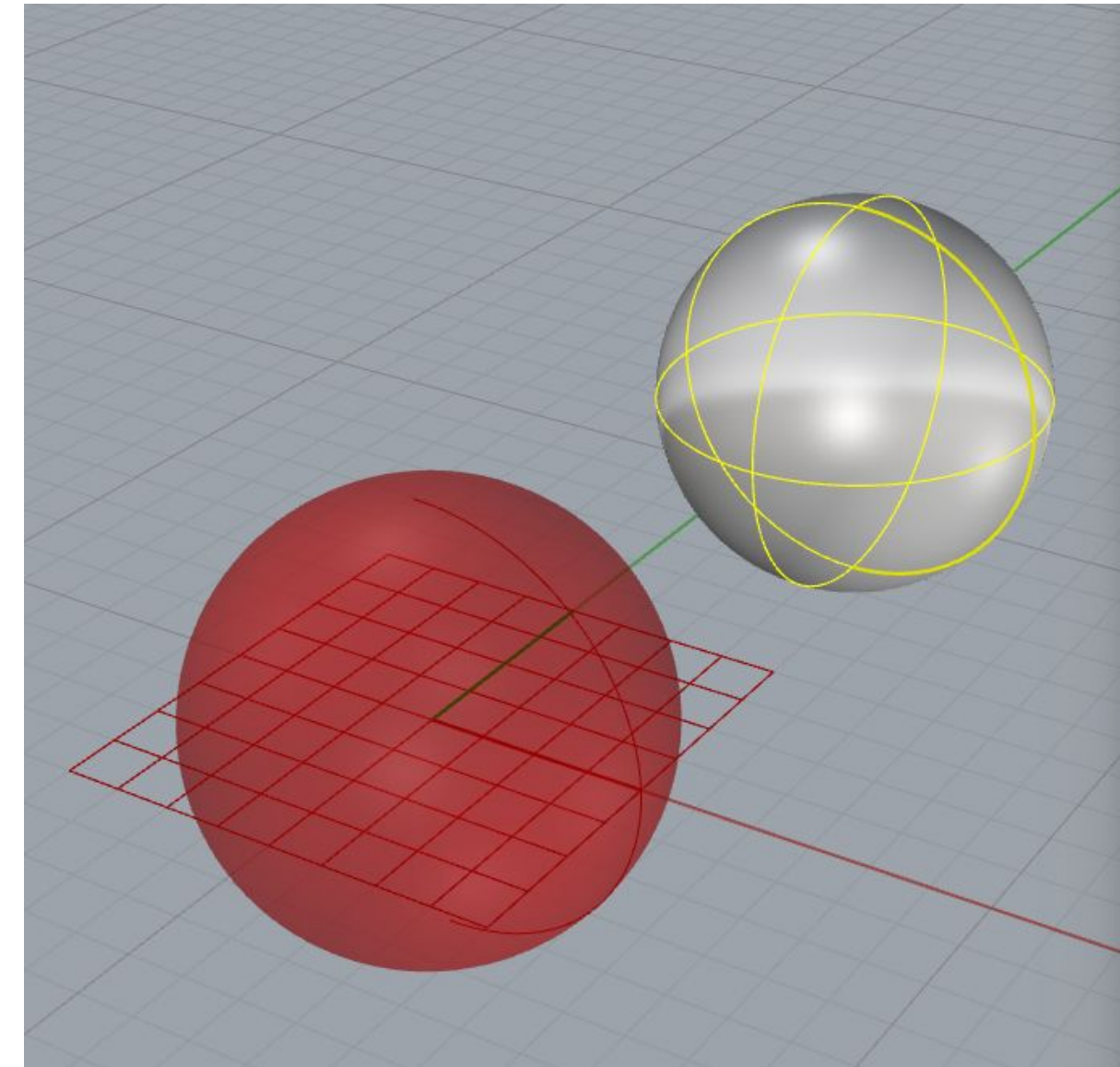
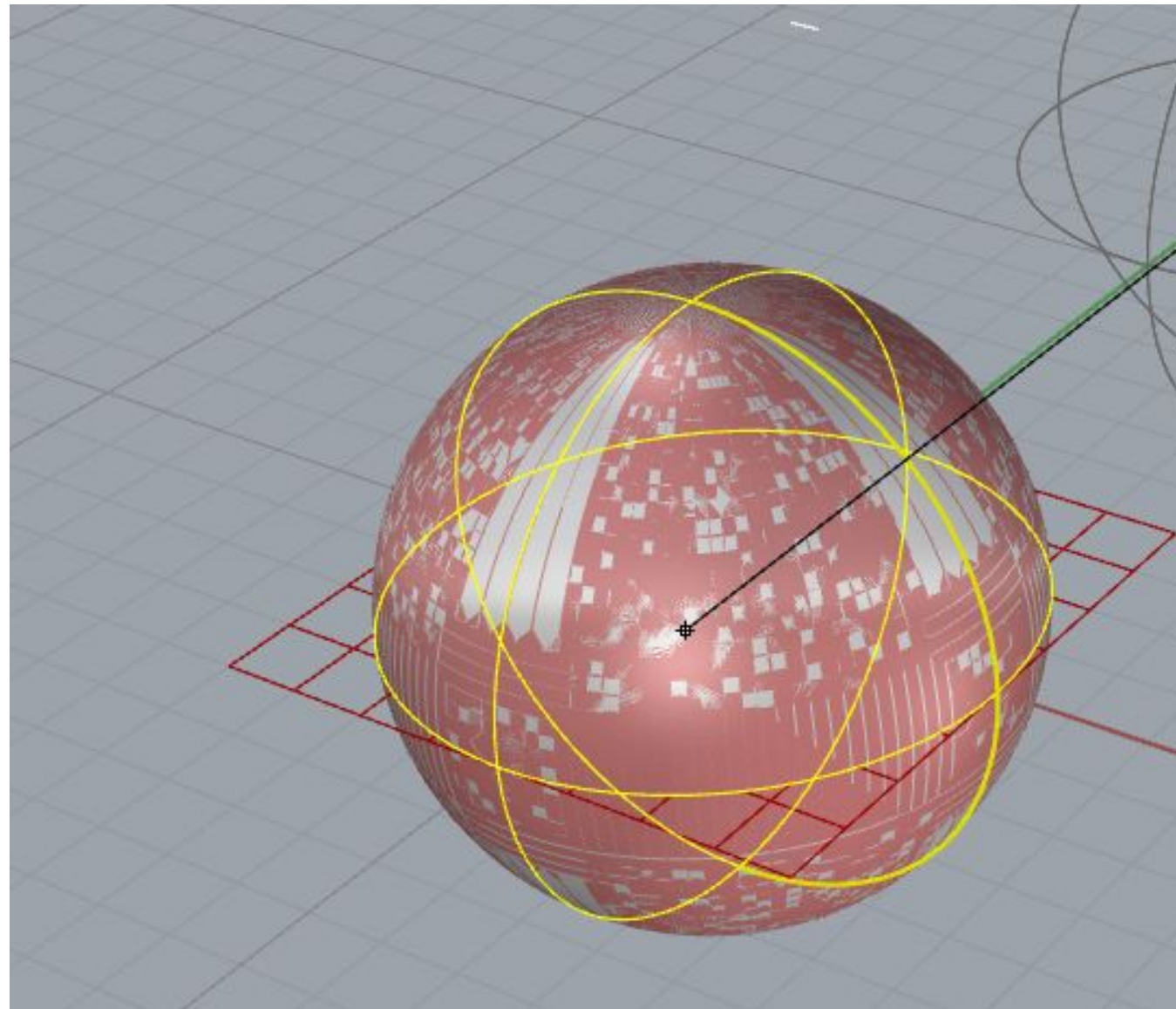
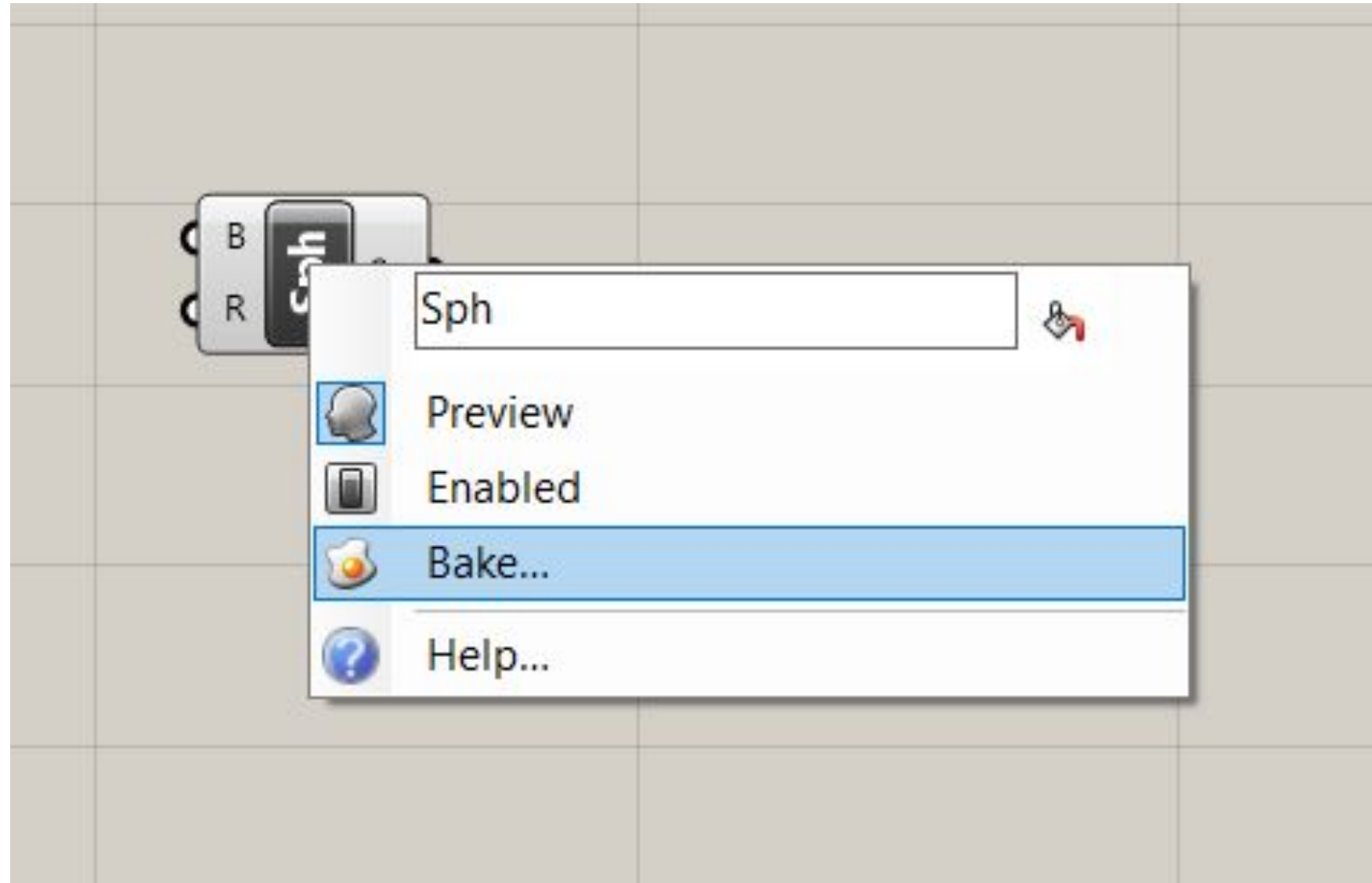
4

☒ Commit changes

☐ Cancel changes

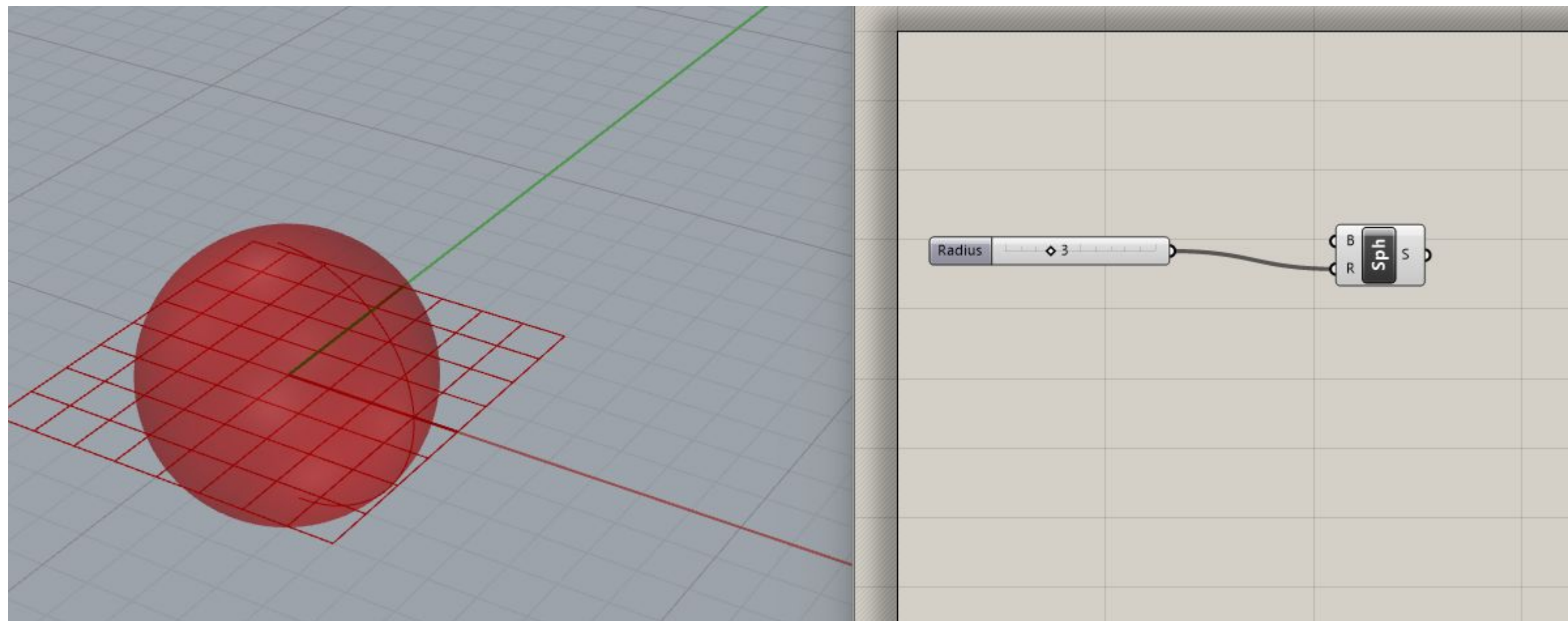
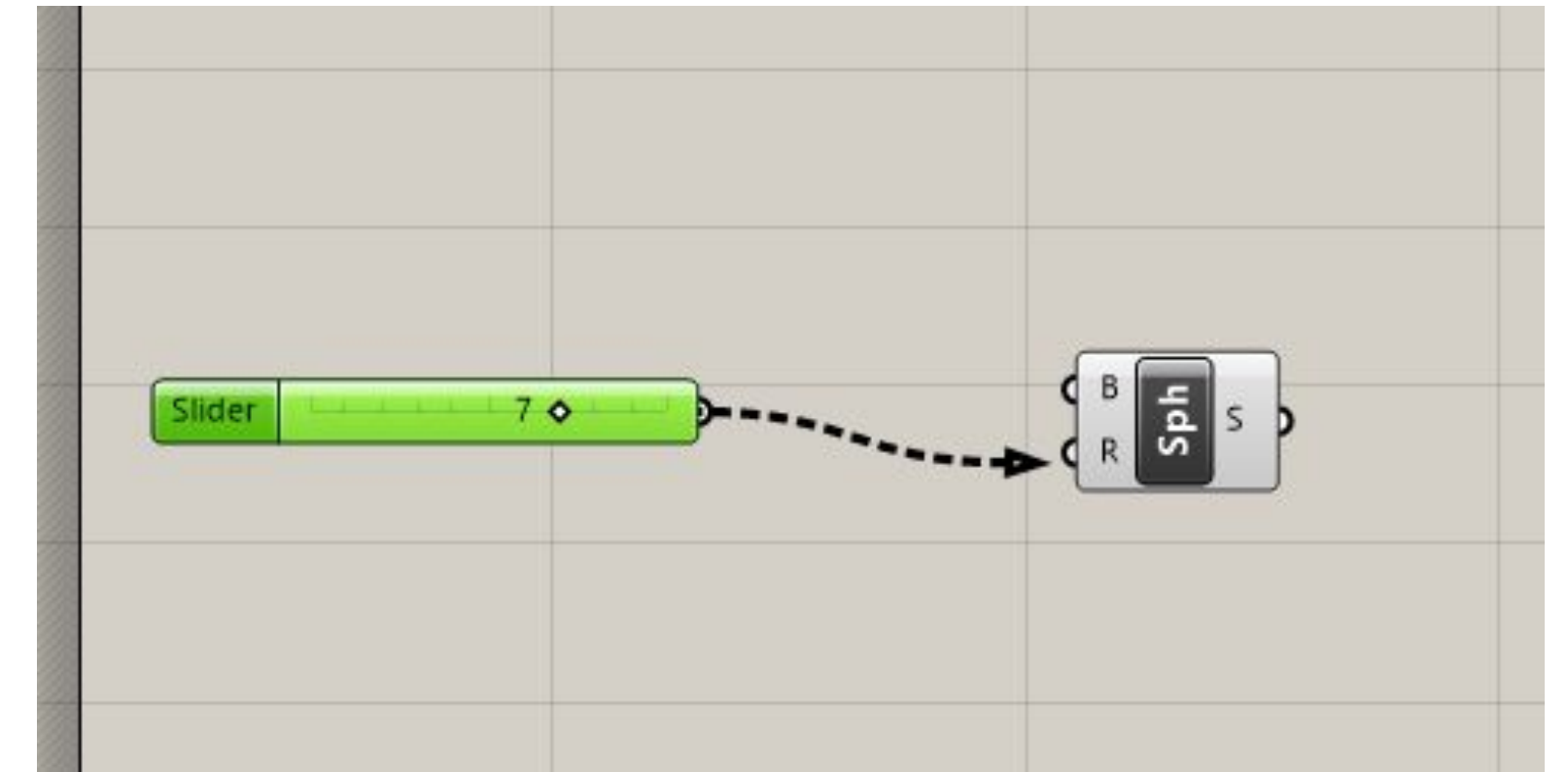
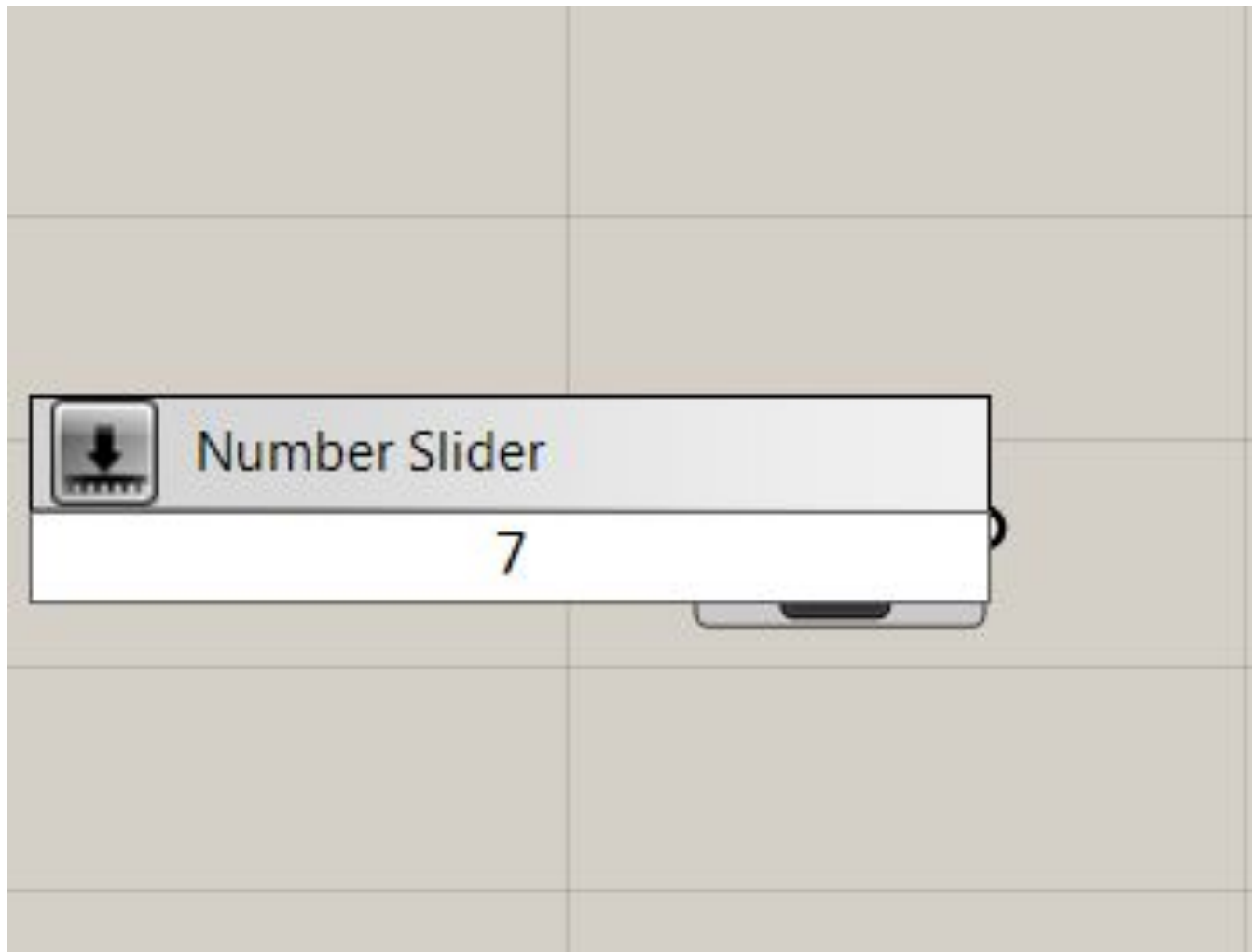


botão dir do rato em cima do "r" , "set
number", alteramos para 4 (ou seja 4
de raio), commit changes

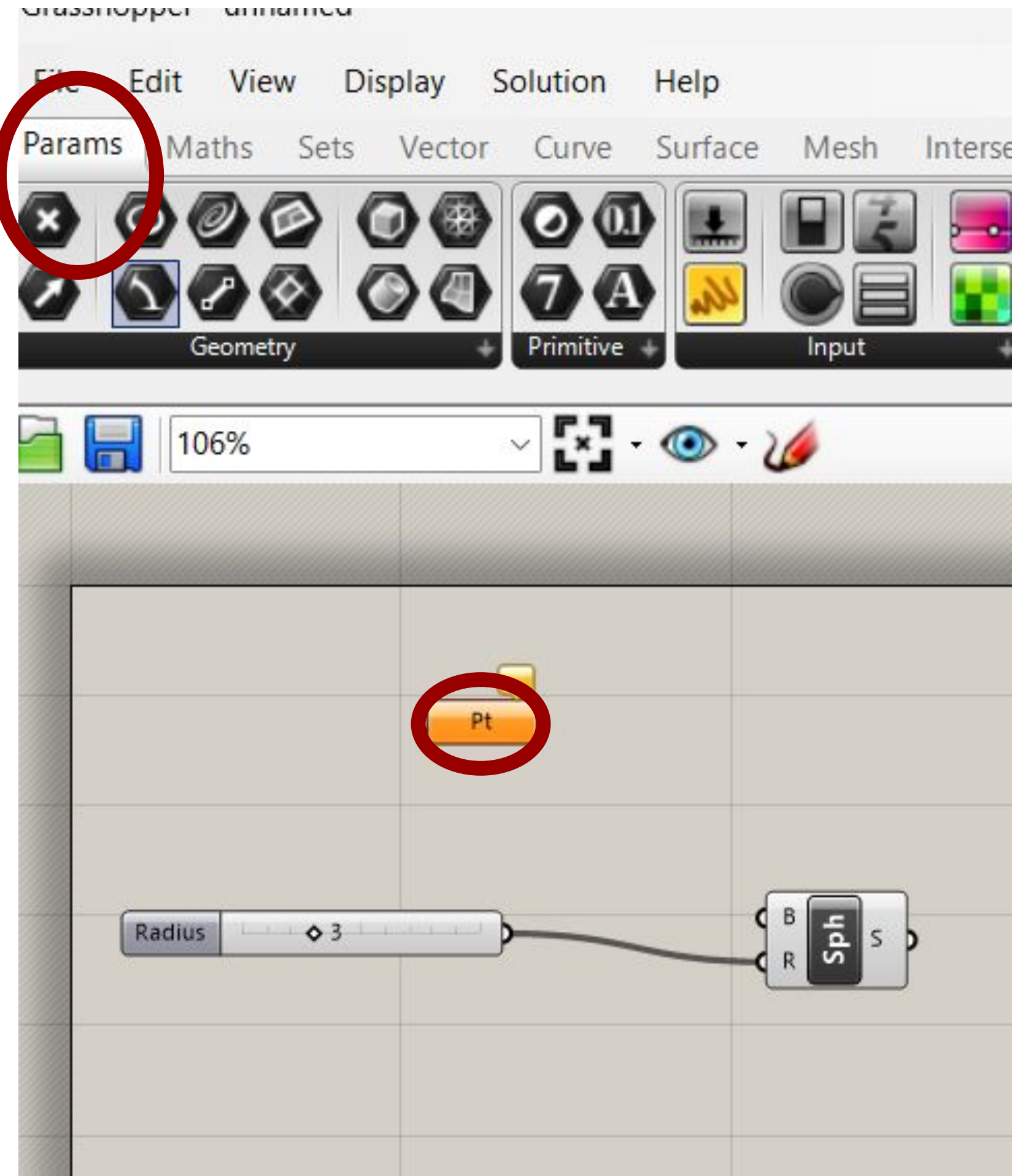
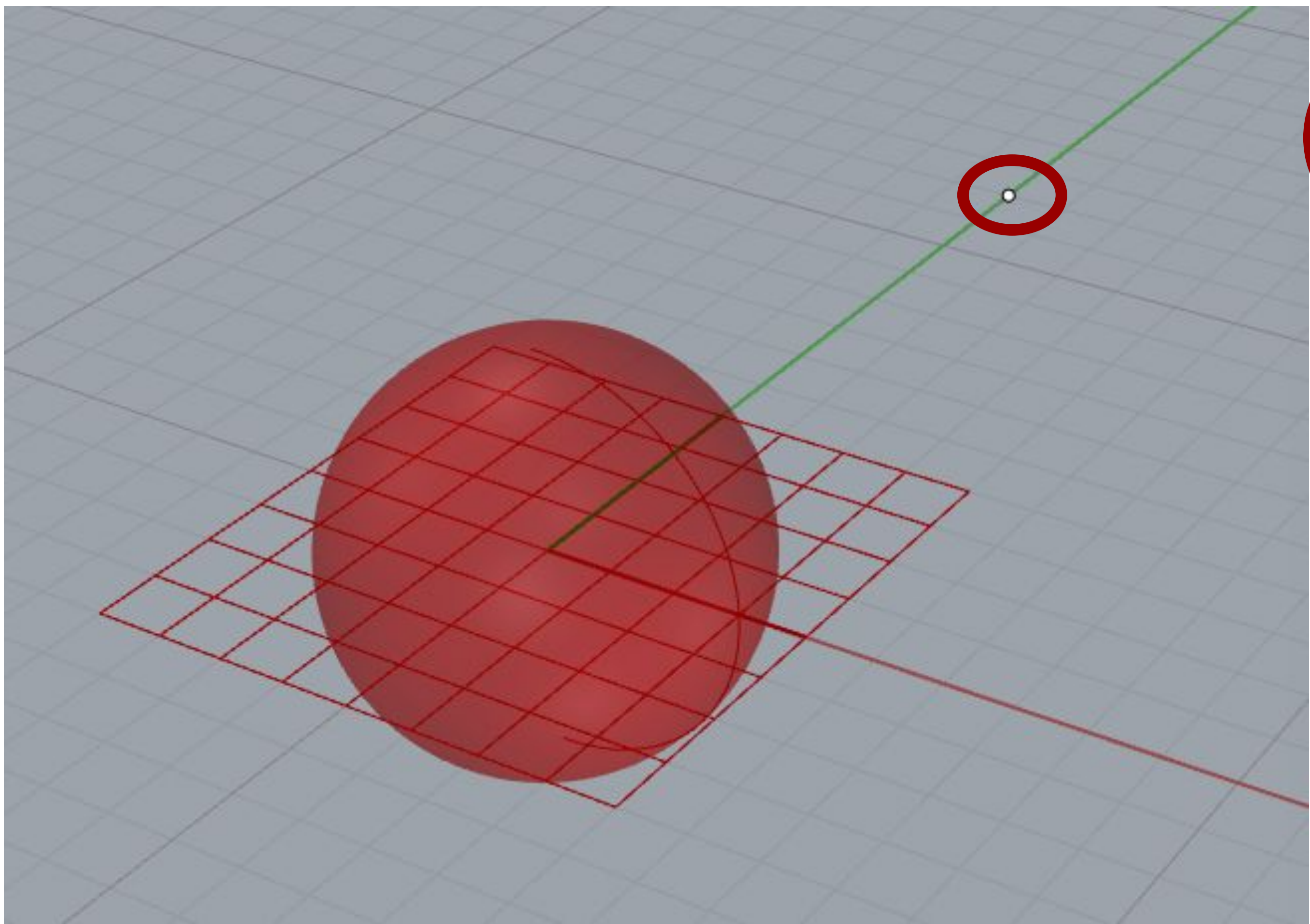


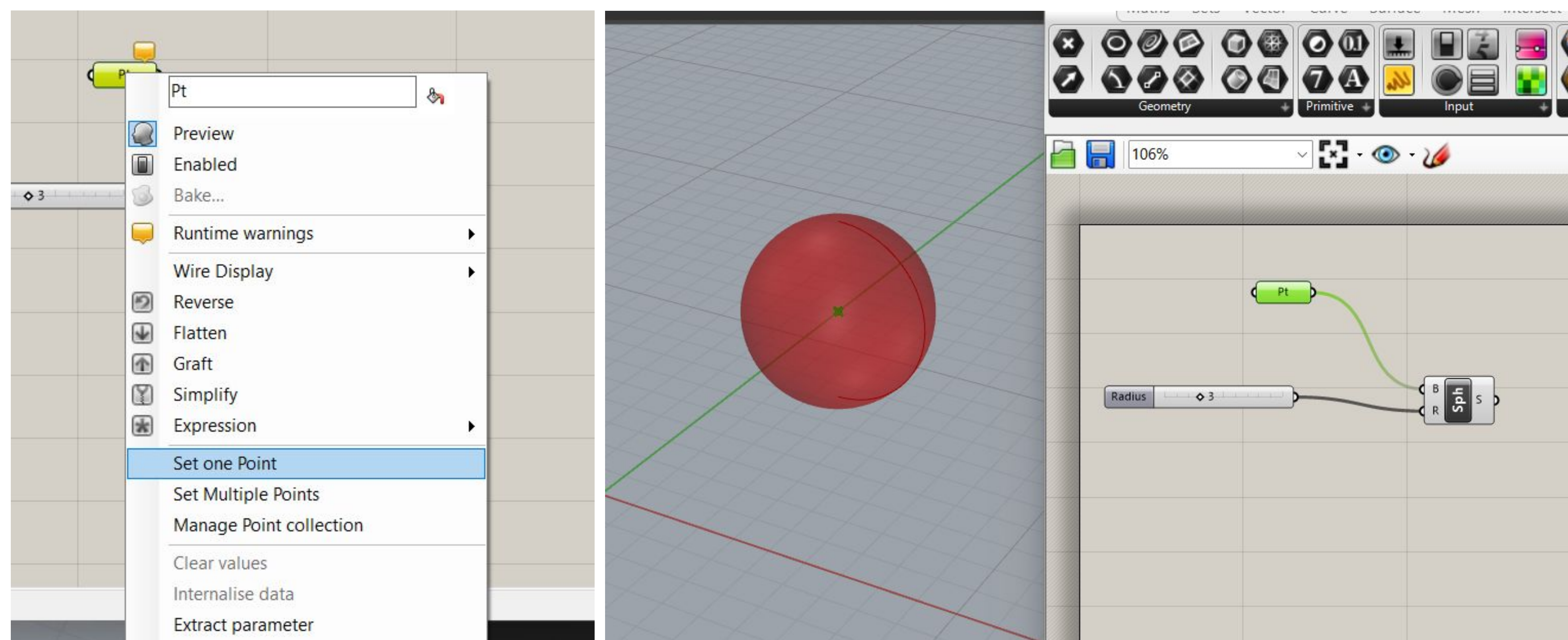
- botão dir em cima de "SPH", "Bake", "ok", arrastar a esfera

- raios inteiros

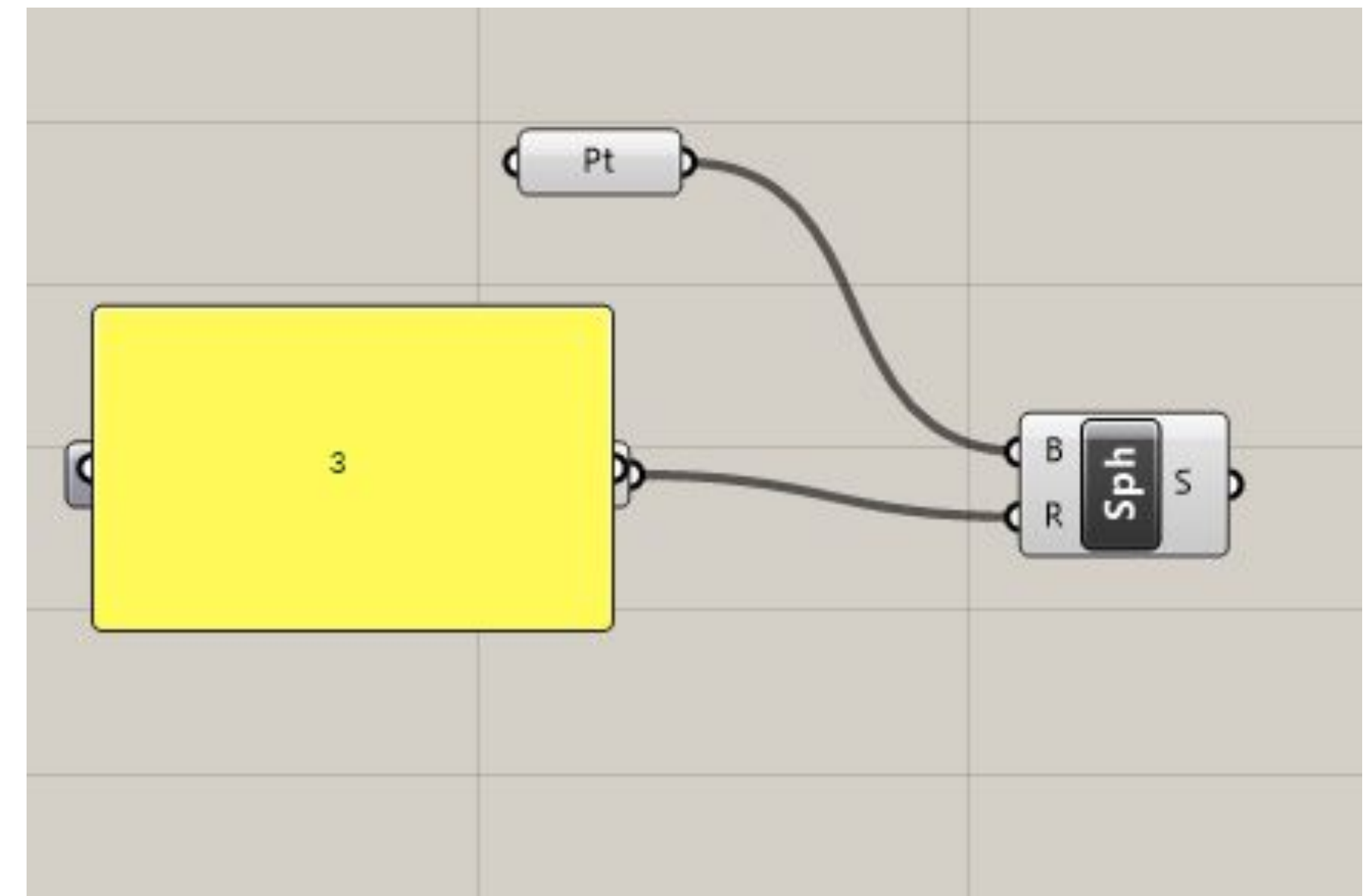
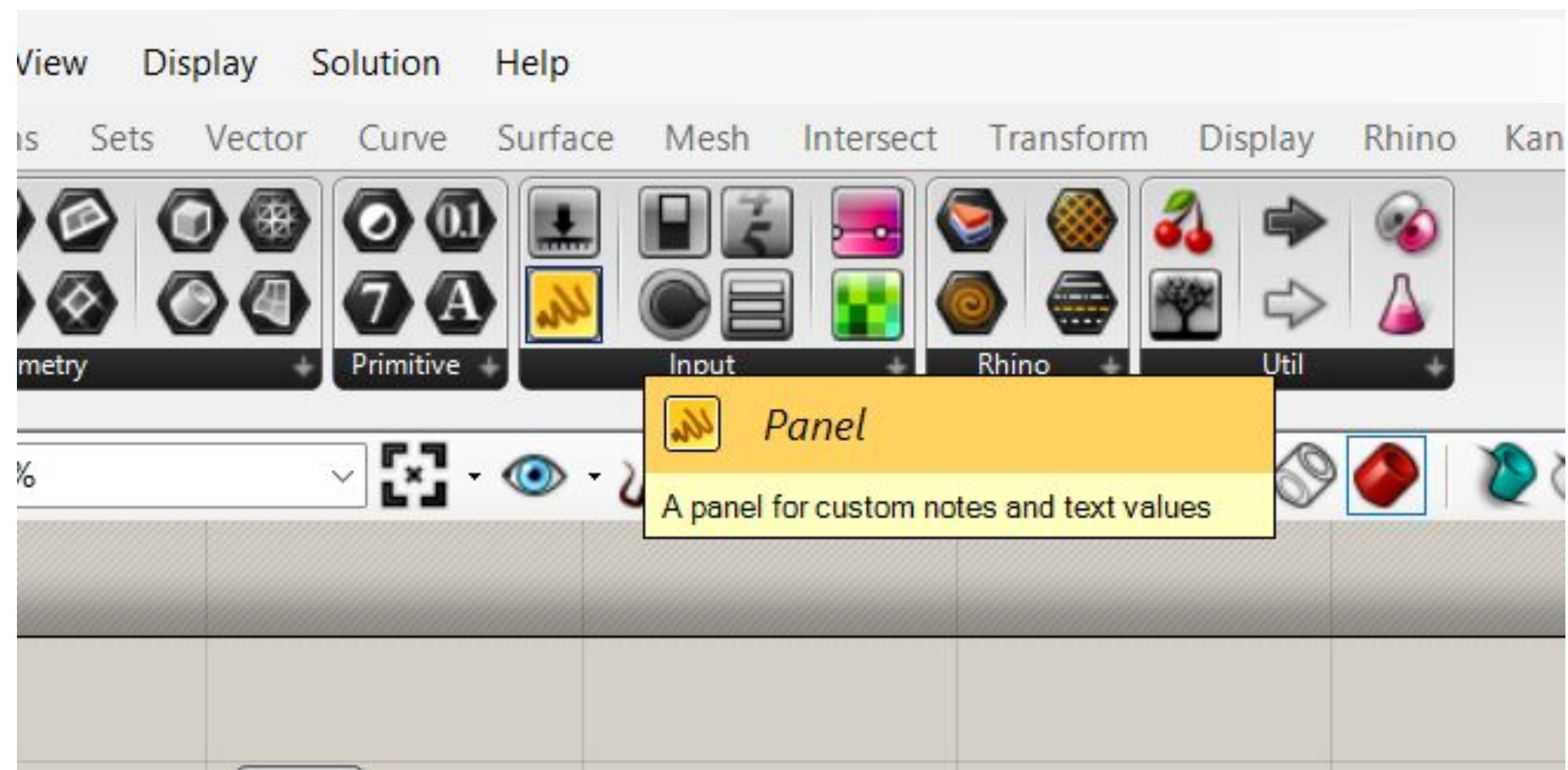


- RAIOS INTERIOS = carregar 2x na tela do grasshopper, metemos 7, enter, vai aparecer uma barra (se arrastarmos alteramos o valor, dps trocamos para 3), puxar a bolinha do valor até à bolinha do raio = altera o raio

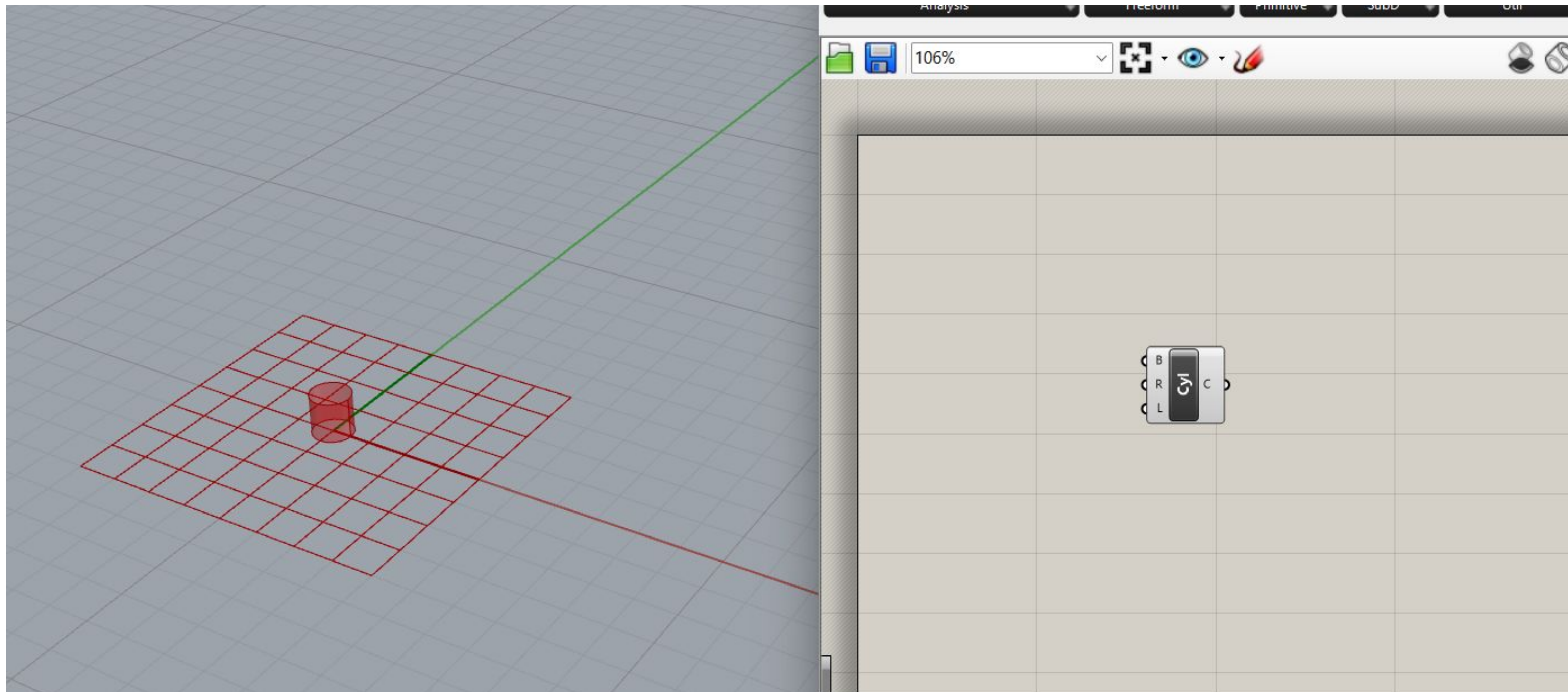




- marcar um ponto na "perspetiva"
- no grasshopper ir a "params" e depois na cruz, colocar o ponto algures na tela. Carregar no ponto com o botão dir , "set one point"
- ligar a bolinha do "pt" com o "b"

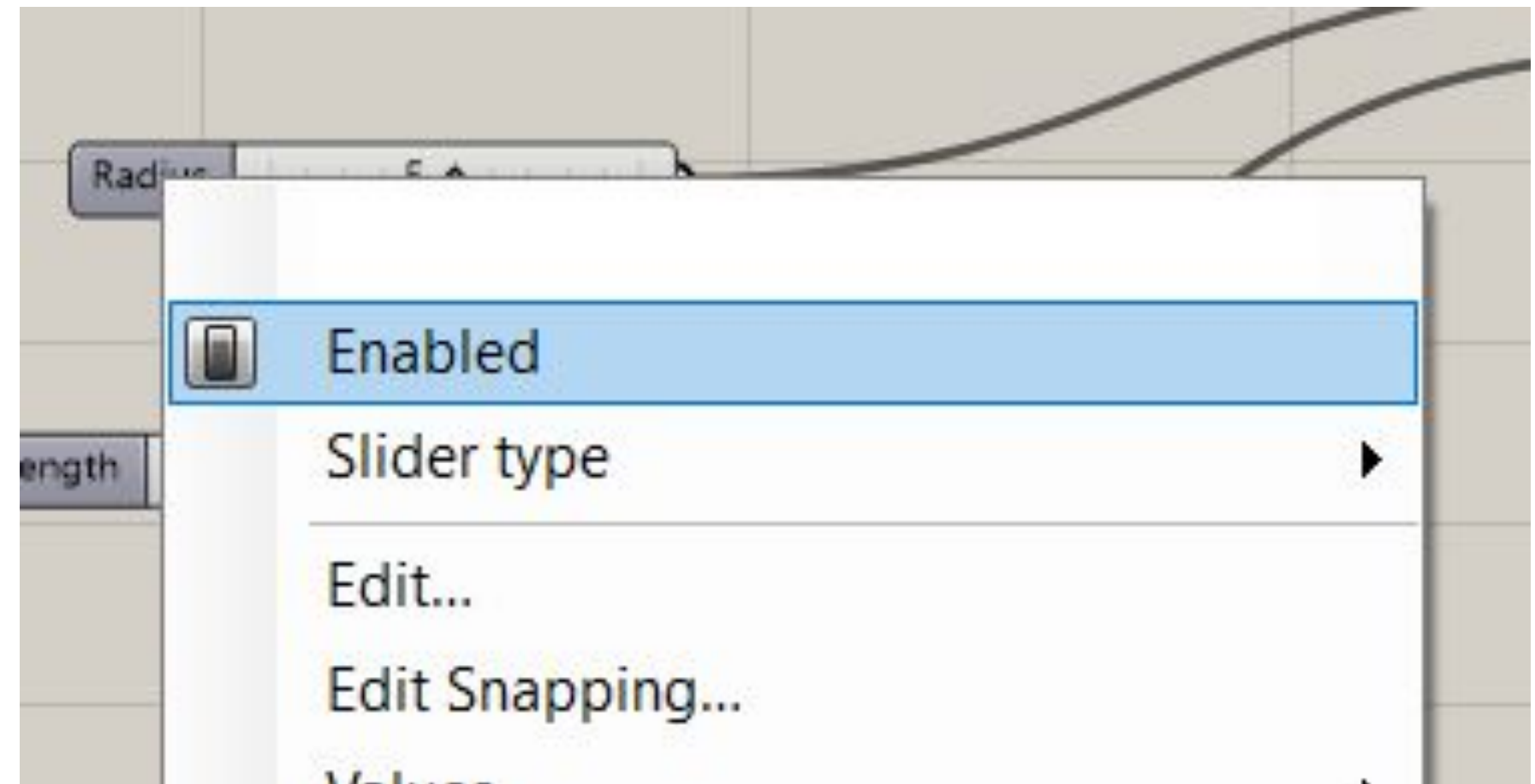


GRASSHOPPER - CILINDRO

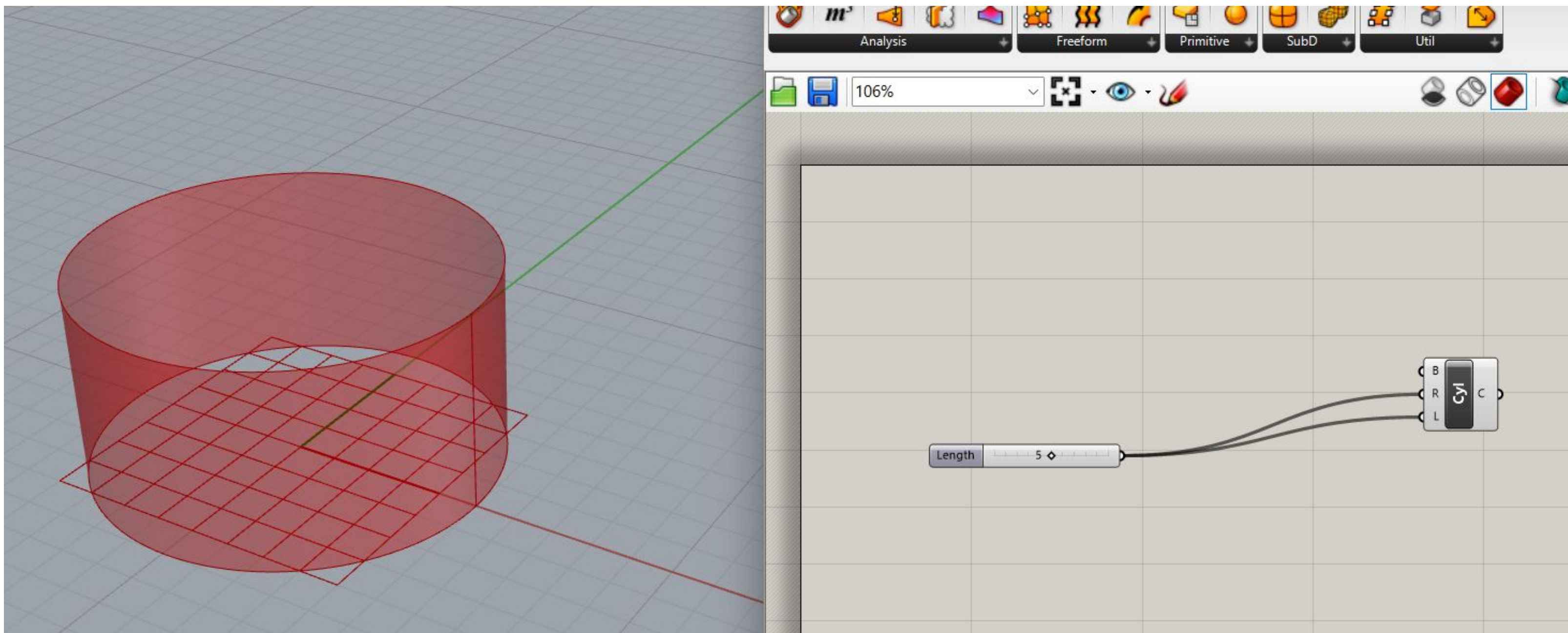
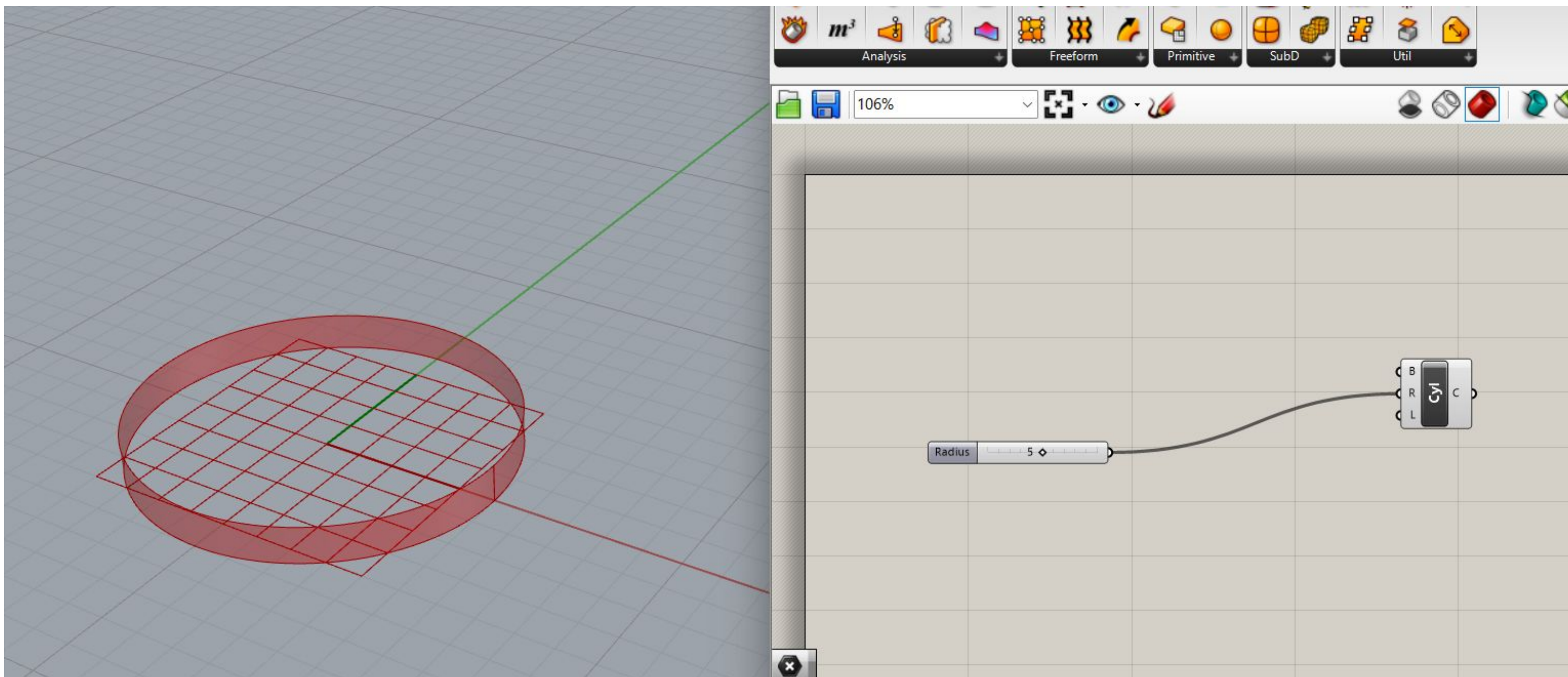


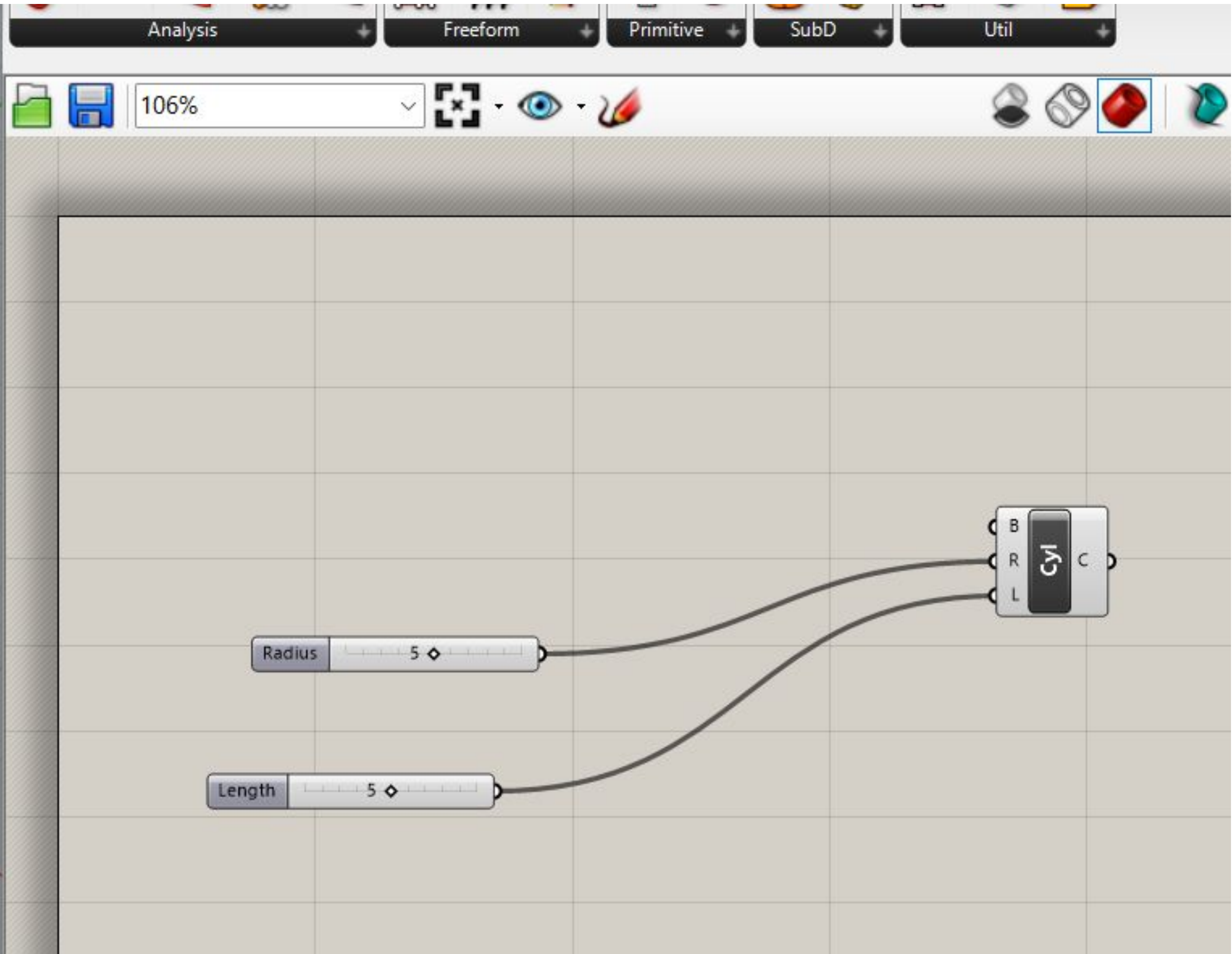
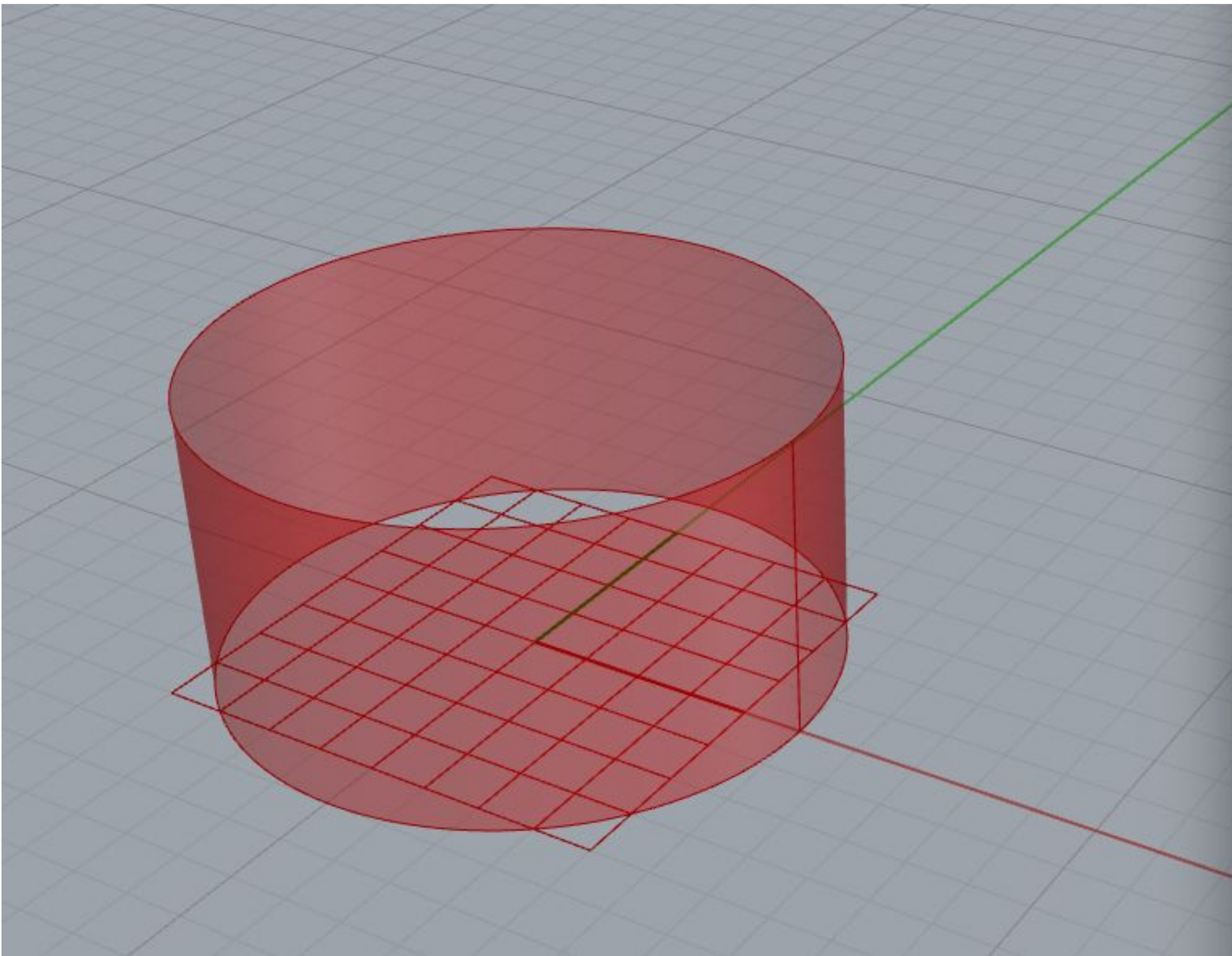
surface, primitivas, cilindro,
criar um cilindro com 5 de raio e 5 de
altura

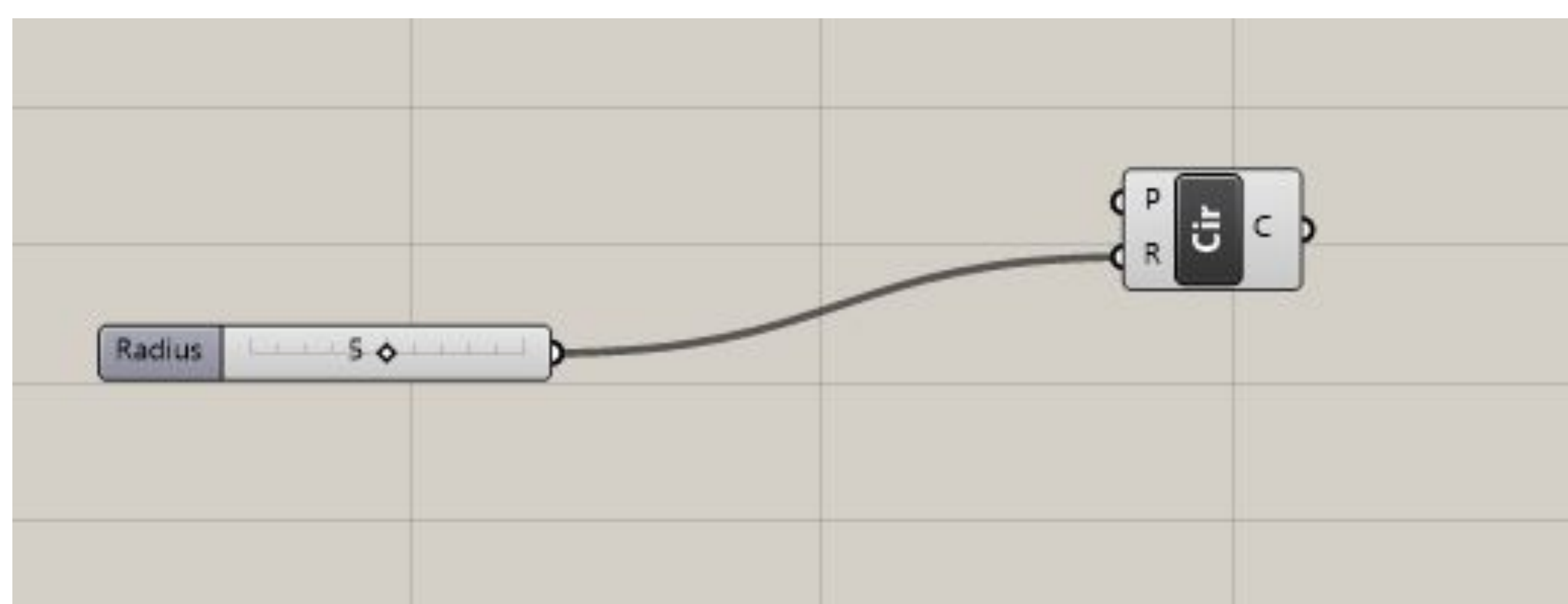
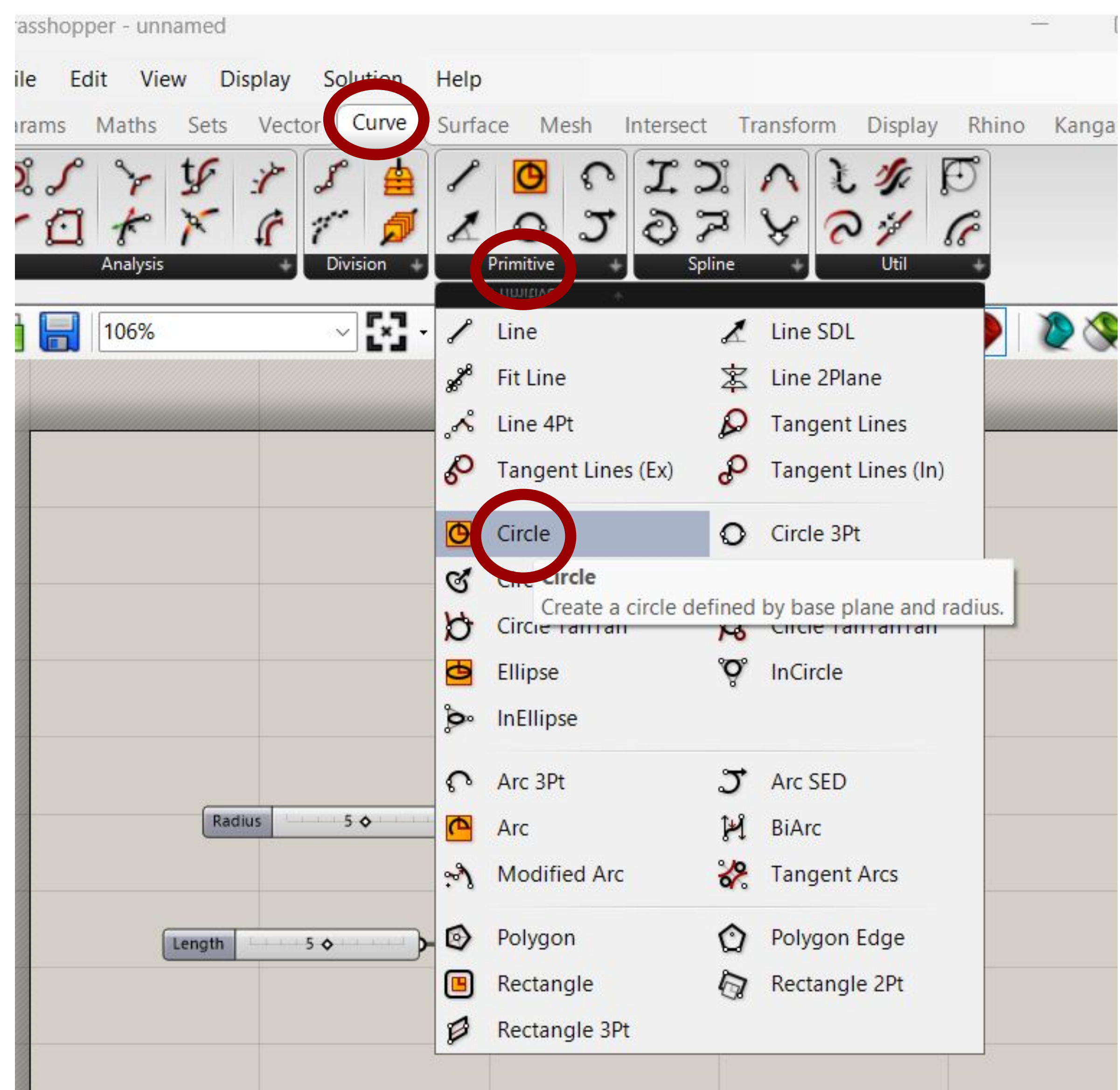
- carregar 2x na tela, "5", ligar ao "r"
- se eu quiser adicionar outra ligação carrego na bolinha e SHIFT
- se quiser tirar uma das ligações carrego em CTRL

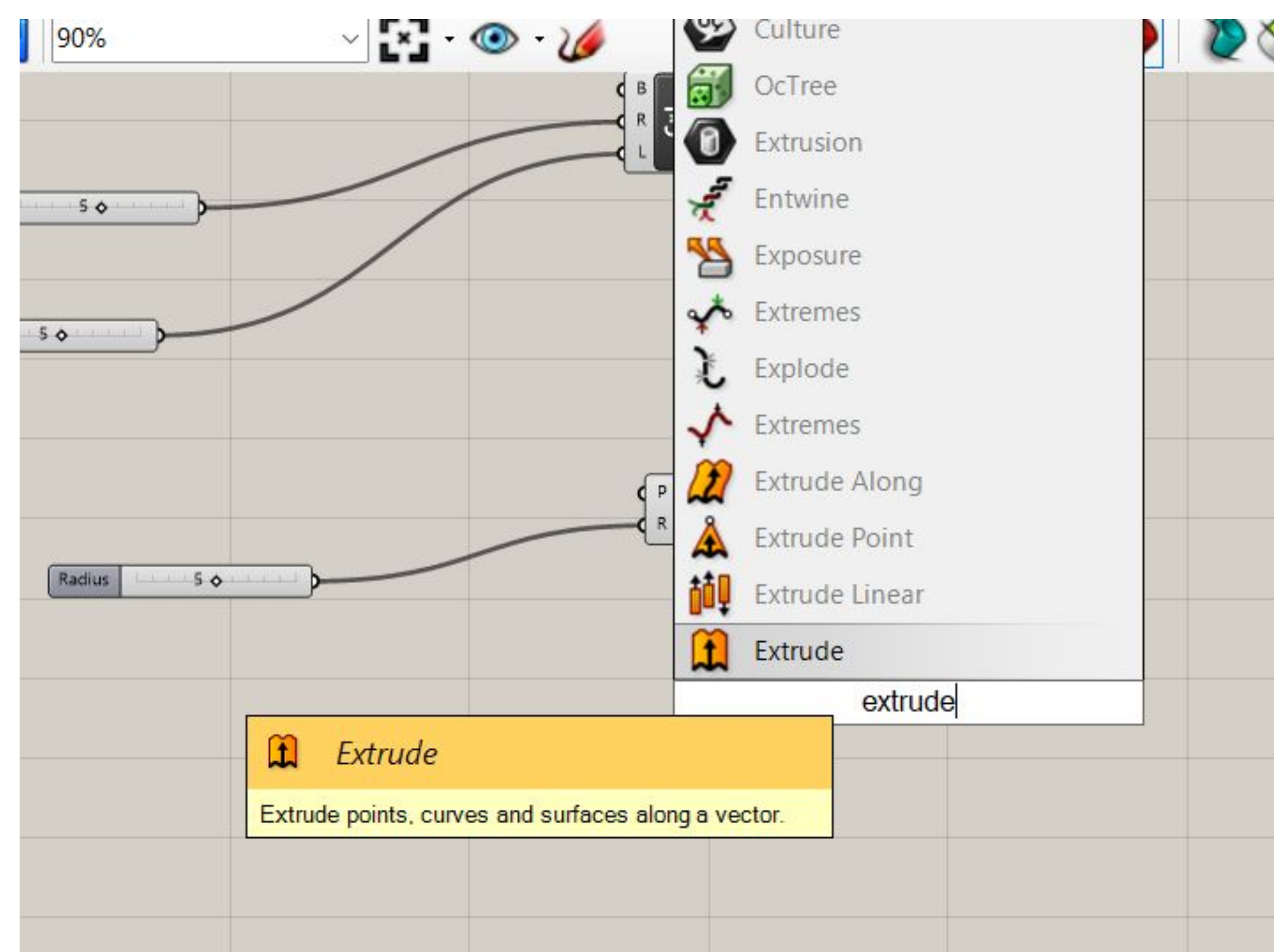


"enabled" para desativar camadas

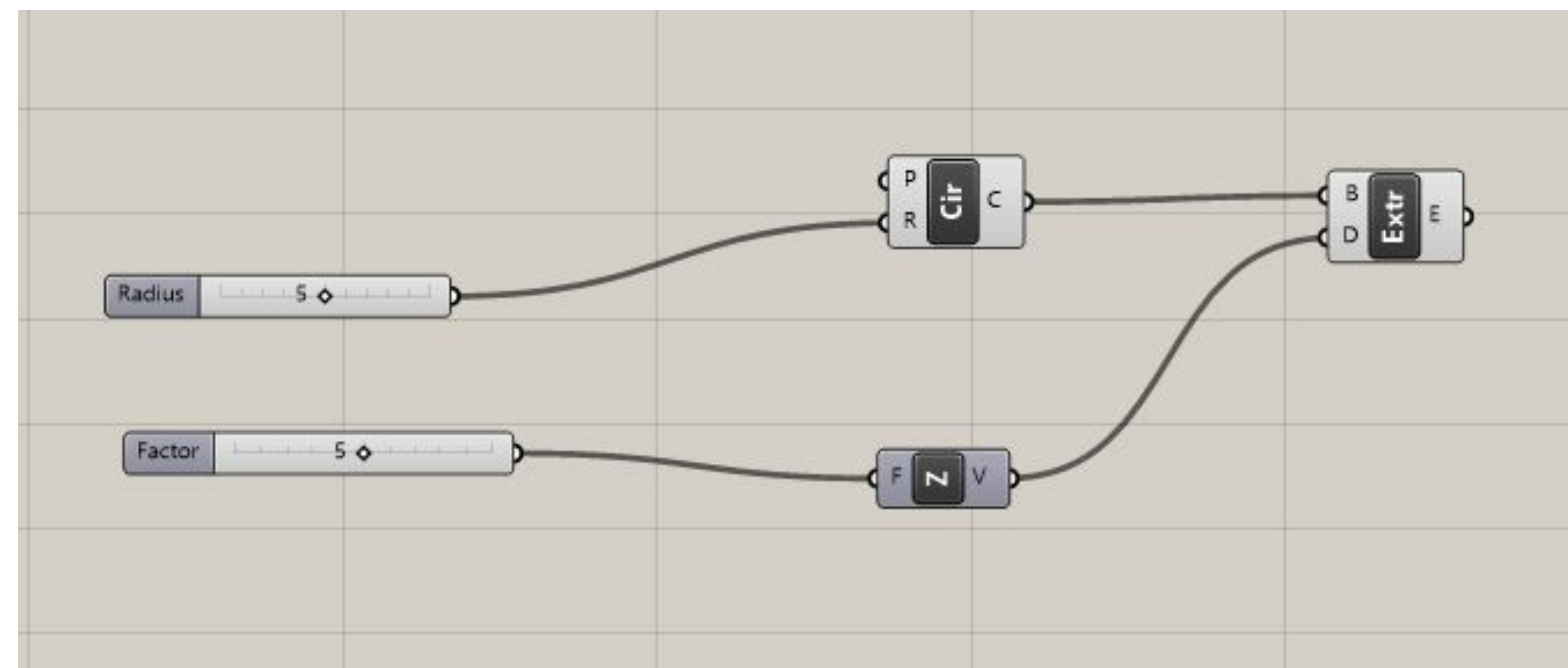


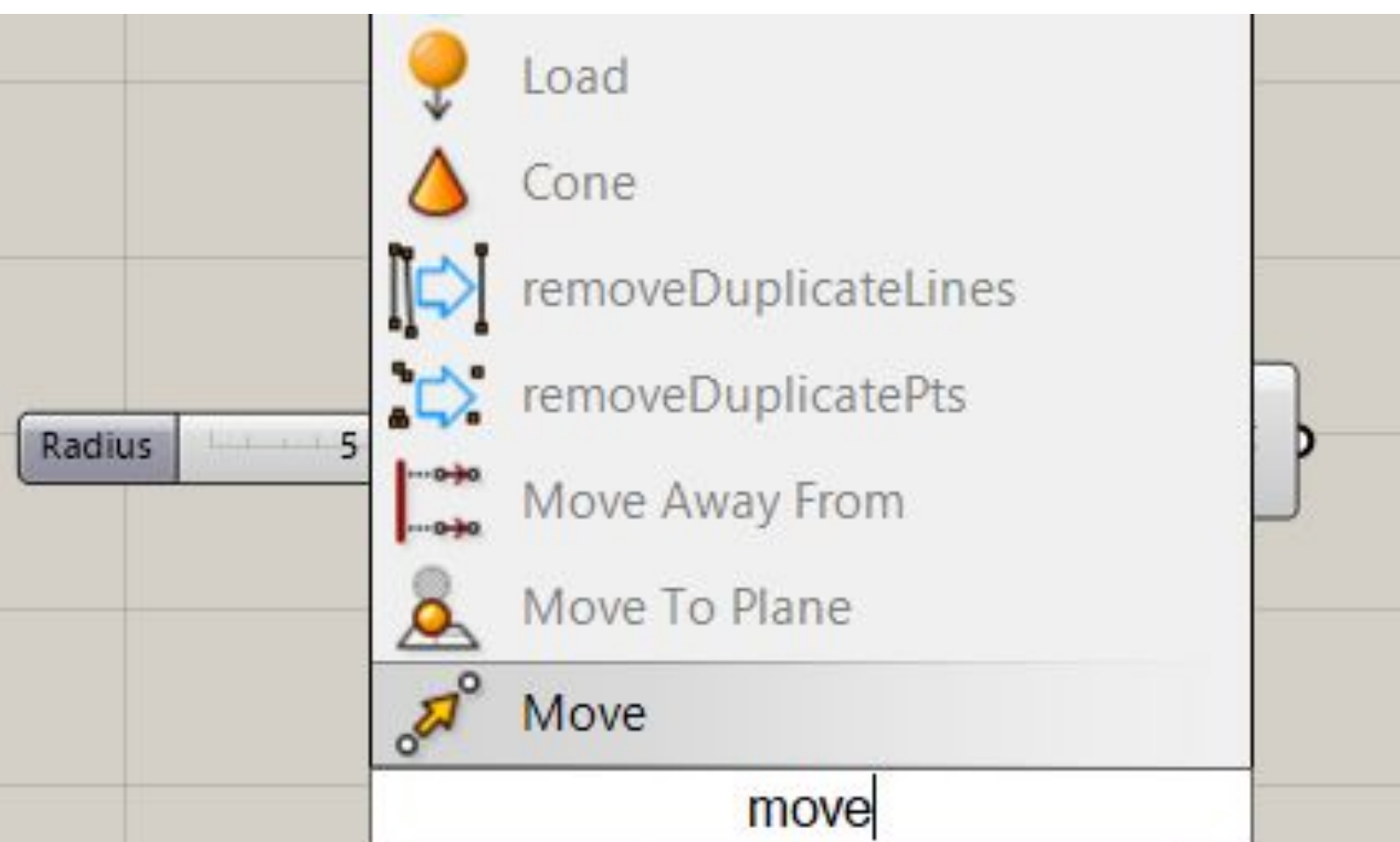
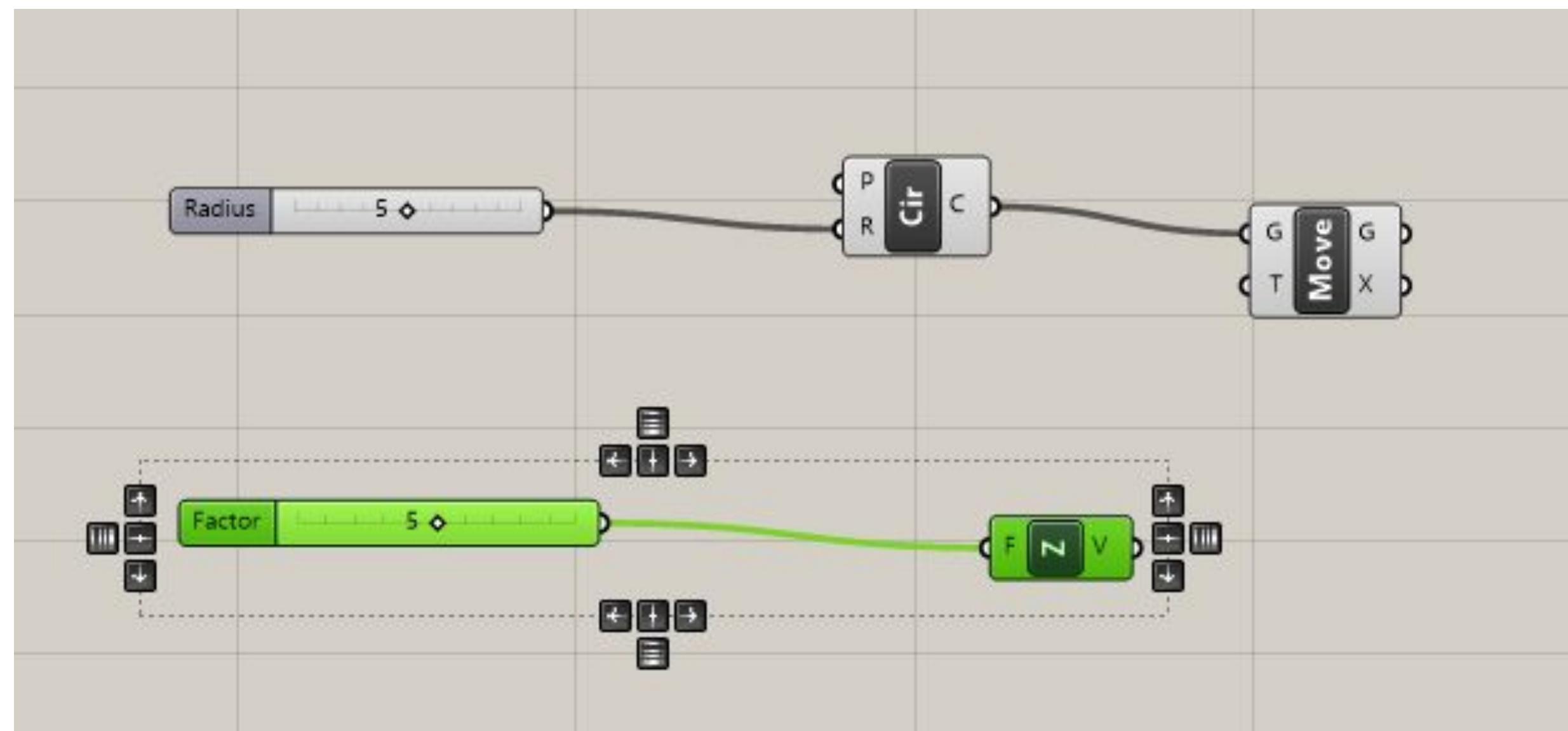




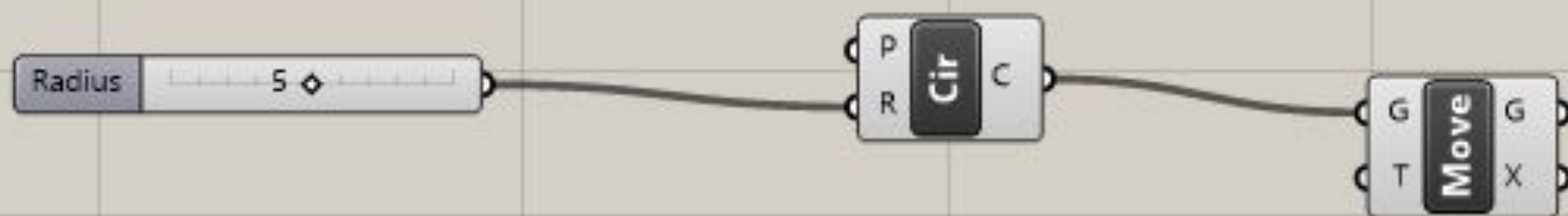


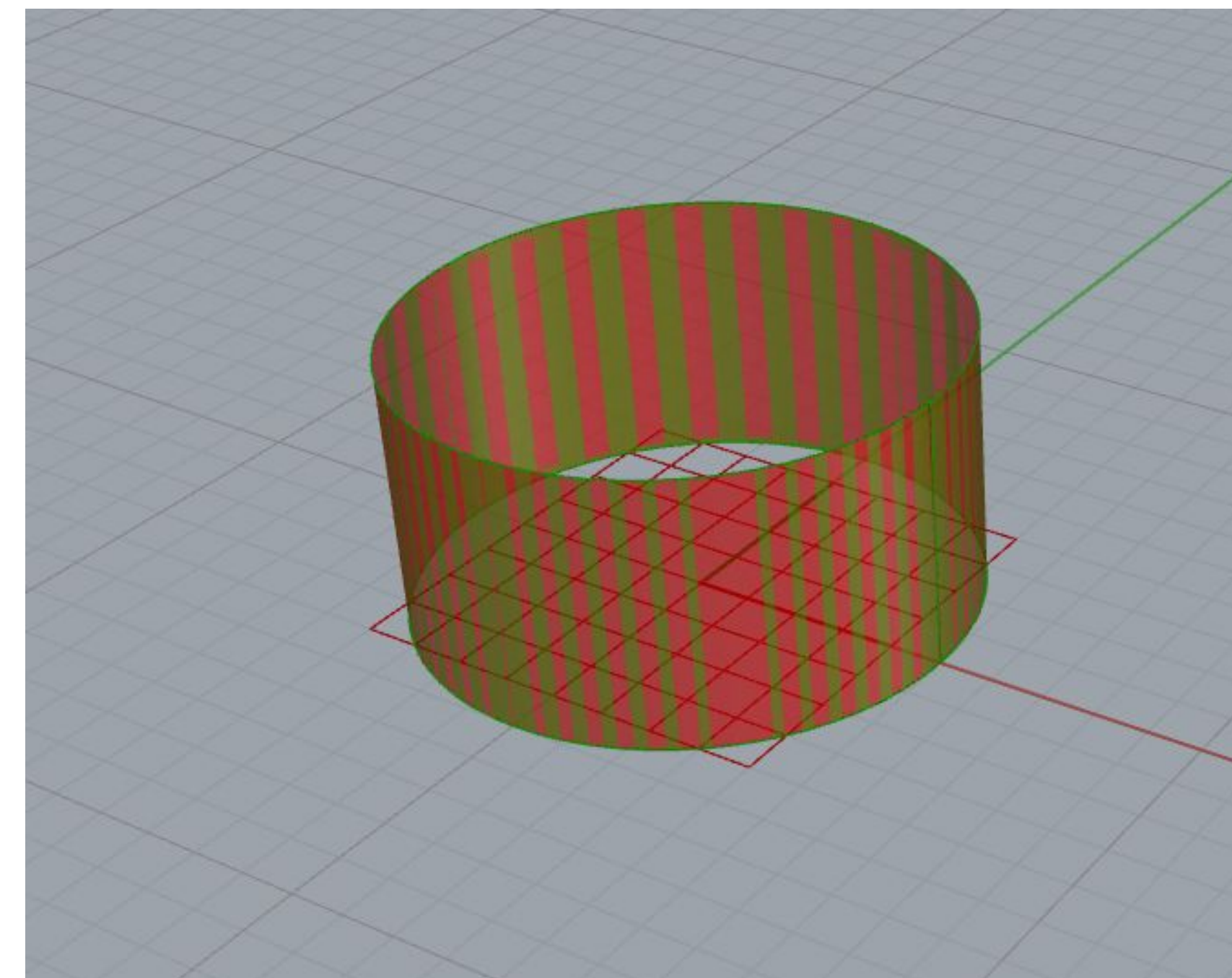
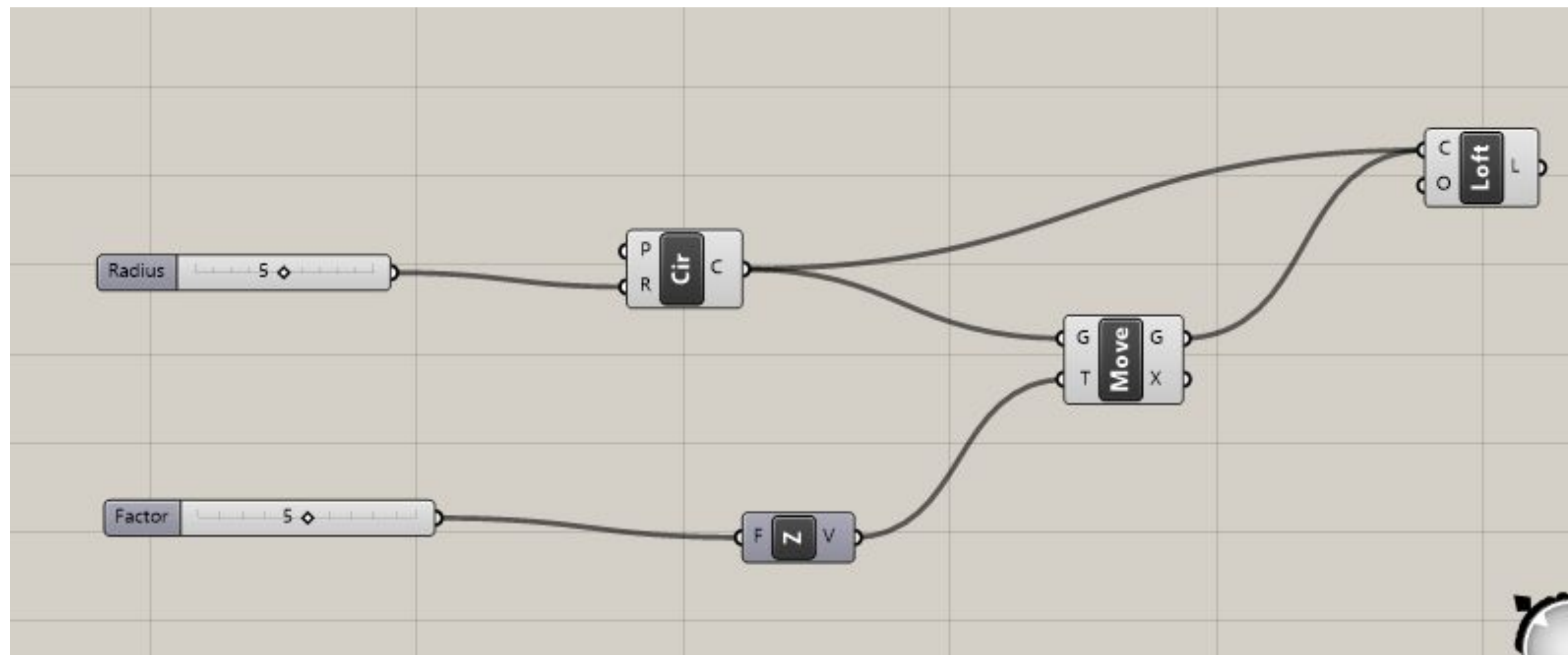
- carregar 2x na tela, escrever "extrude"
- vector, unit Z colocar no painel





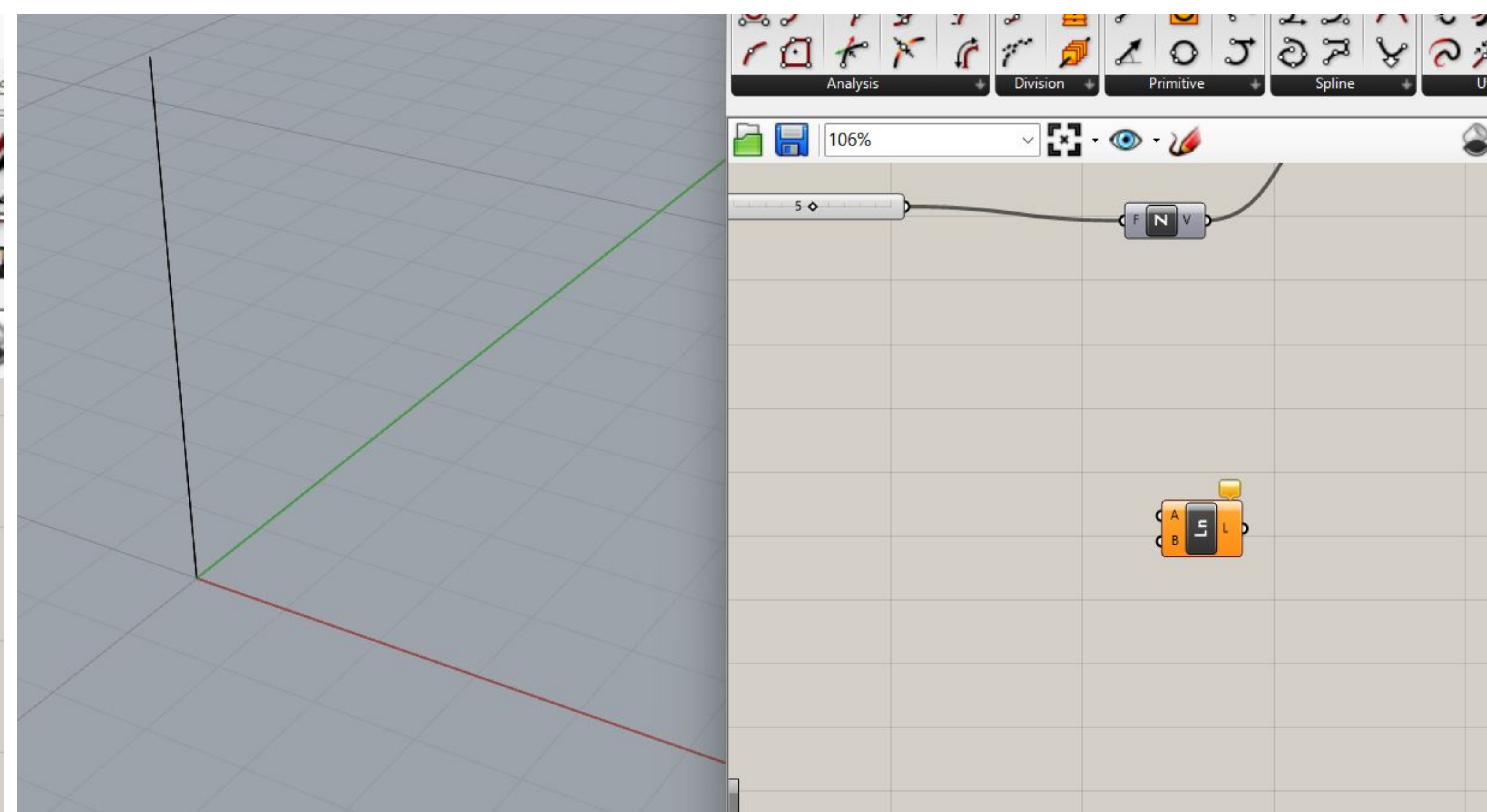
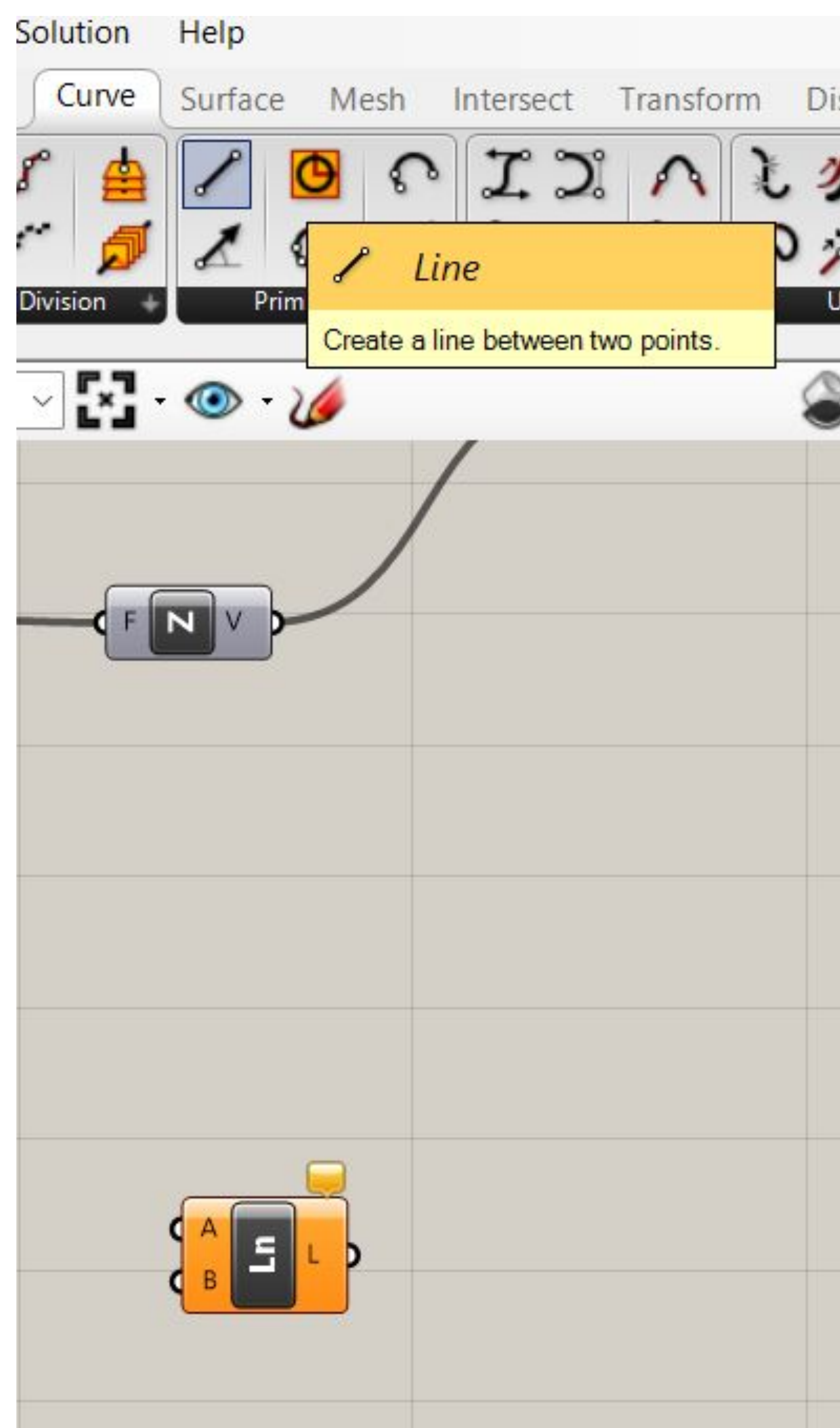
curve, primitive, circle
carregar 2x na tela, alterar o raio
para 5
carregar 2x na tela, move, ligar "g"
com o "c" no cir
dar copy paste no vector, "unit z
colocar no painel" da componente
passada



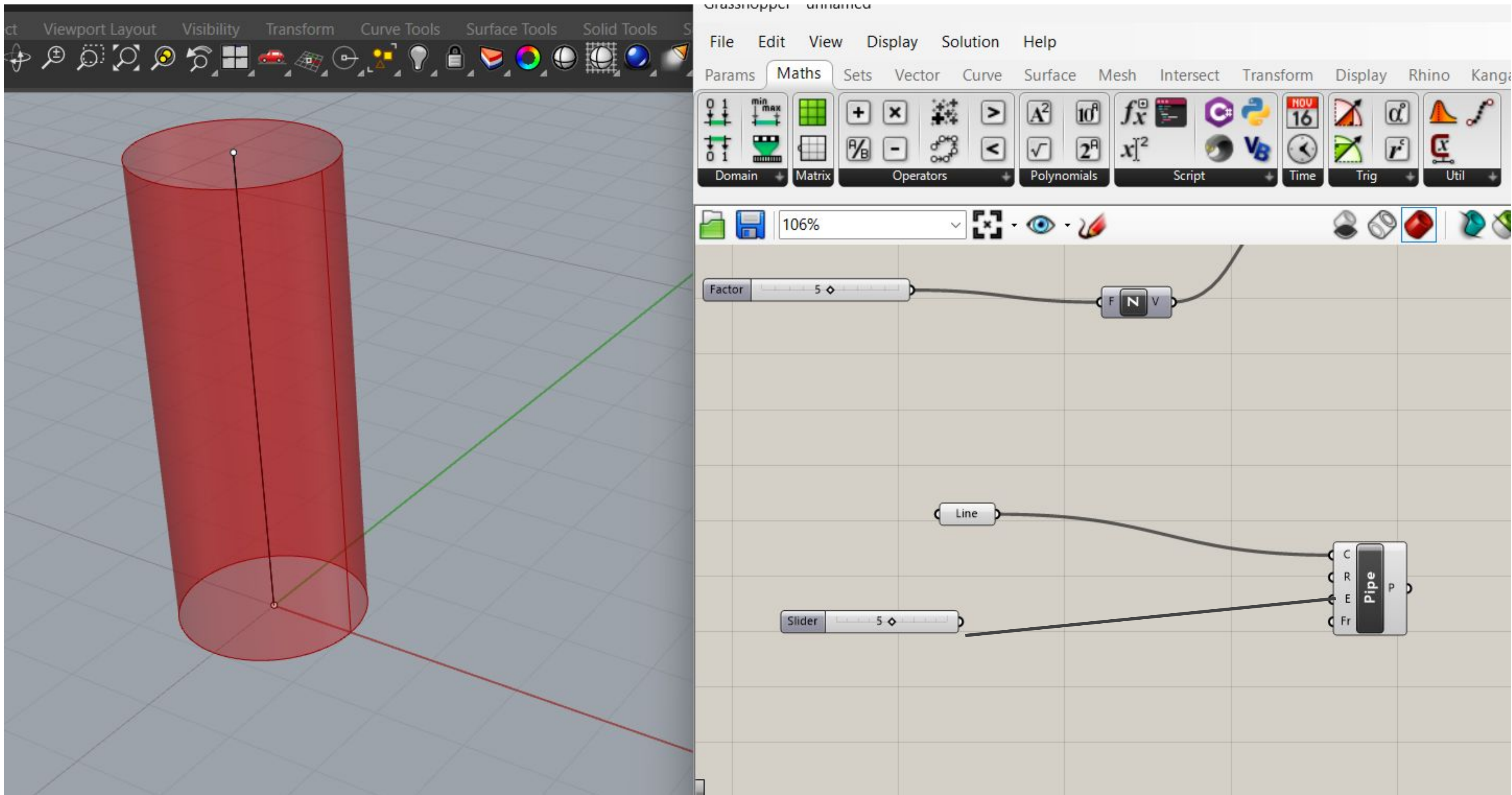


carregar 2x na tela, loft

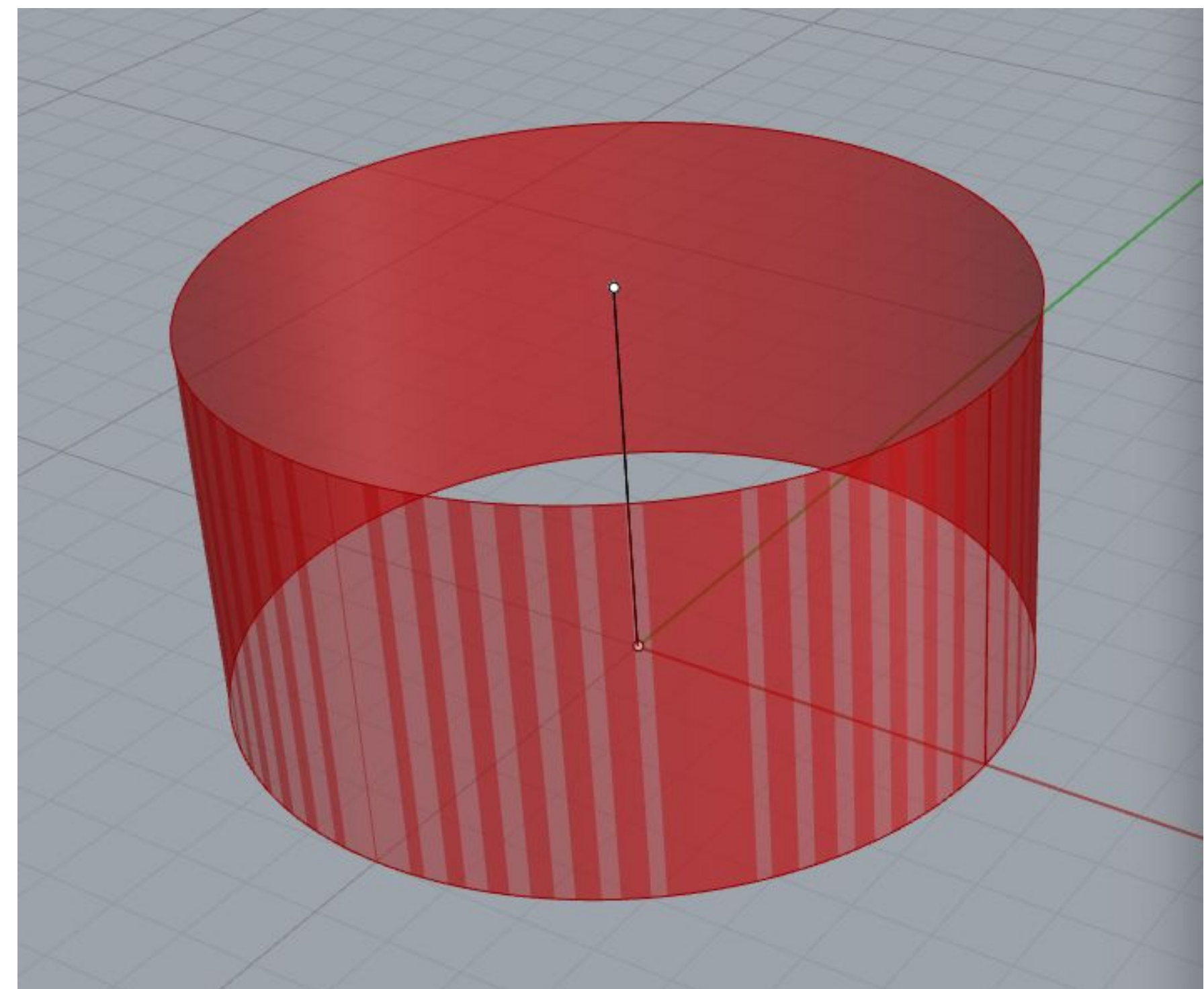
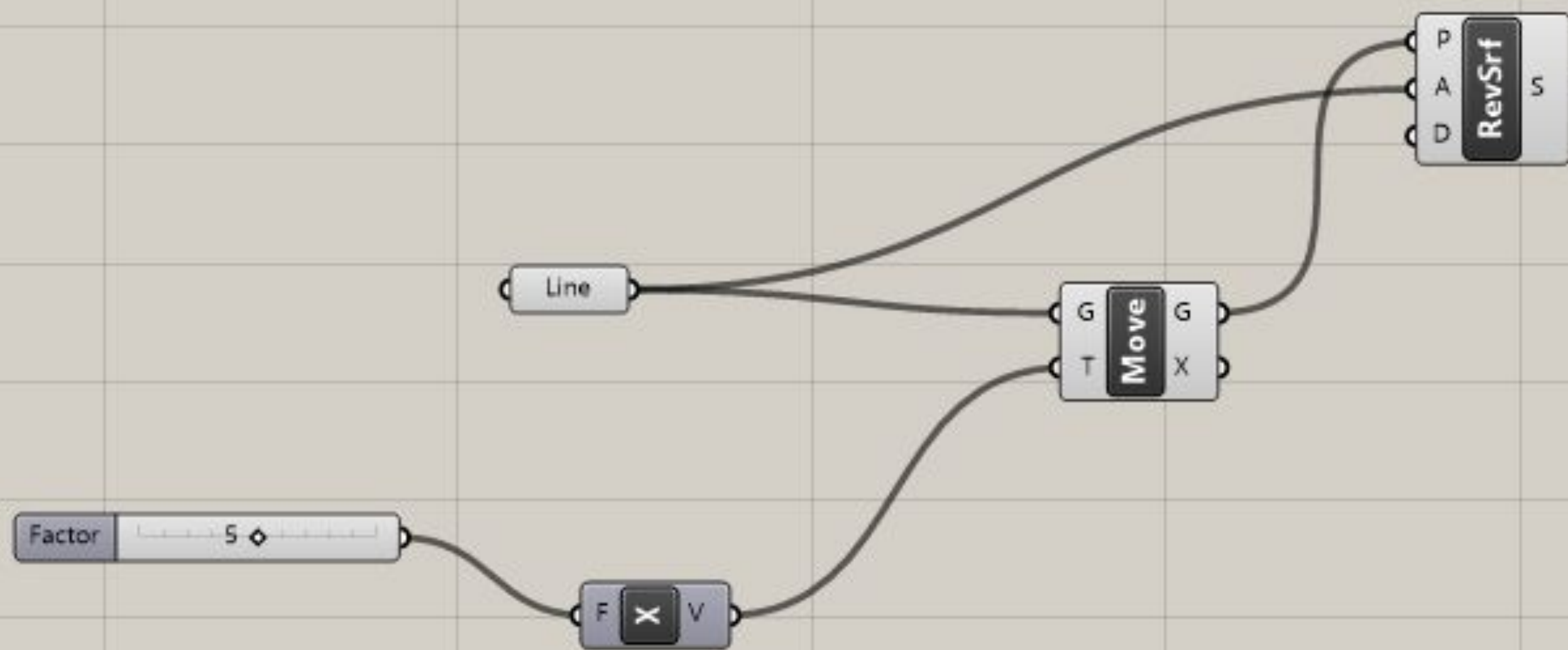
- enabled, no cir e no loft



- curve, primitive, line
- na perspectiva no rhino colocar comando "line", vertical, 5
- |



no painel carregar 2x "pipe"
ligar a line ao "c"
carregar com o botão dir na
"line" "set one line" e fazer
uma linha por cima da linha
vertical na perspectiva
raio com 5, ligar ao "r" do pipe



- carregar 2x na tela, line
- carregar 2x na tela, move
- ligar a line ao "g" do move
- carregar 2x na tela, 5
- vector, unit X
- ligar o 5 ao "F" do unit X
- ligar o "V" do unit X ao "T" do move
- carregar 2x na tela, Revolution
- ligar o "P" ao "G" do move
- ligar o "A" à line

MOLUSCOS

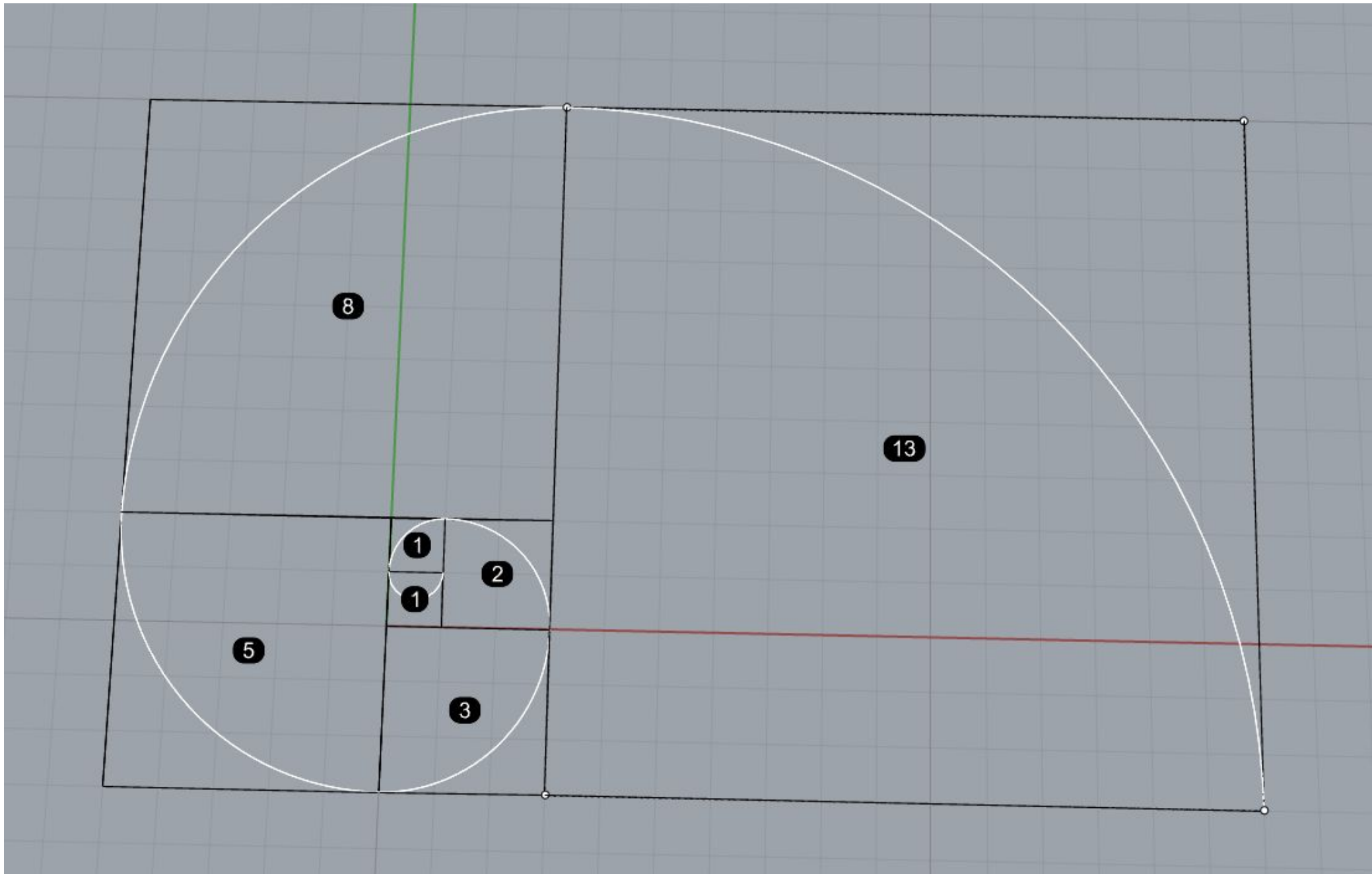
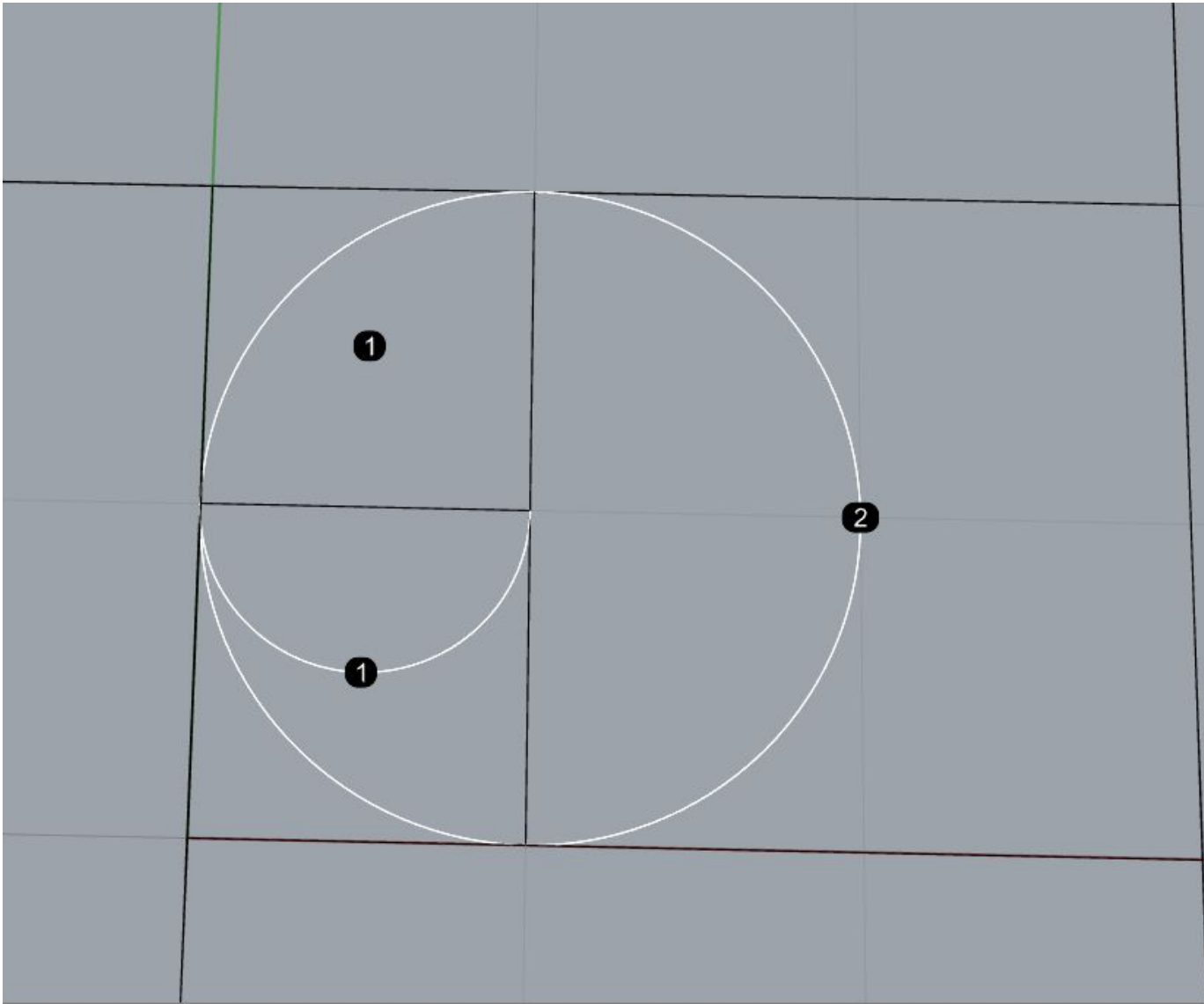
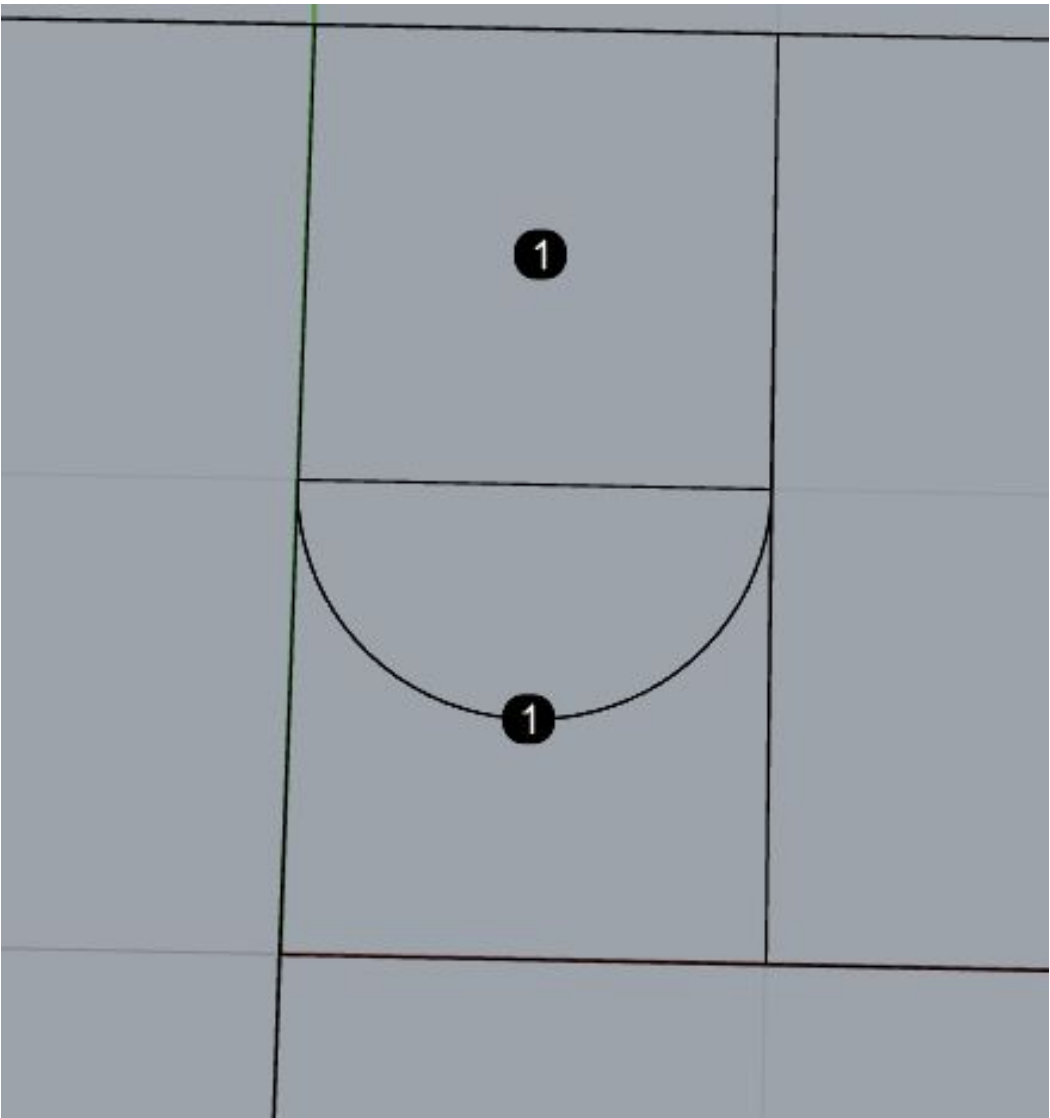
SPIRULA

Layer				Material	Linety
Default	💡	🔒	◻	○	Contin
aux1	💡	🔒	◻	○	Contin
aux2	💡	🔒	◻	○	Contin
geratriz_sha	💡	🔒	◻	○	Contin
diretriz_rail ✓			◻	○	Contir
notas	💡	🔒	◻	○	Contin
text	💡	🔒	◻	○	Contin
cotas	💡	🔒	◻	○	Contin

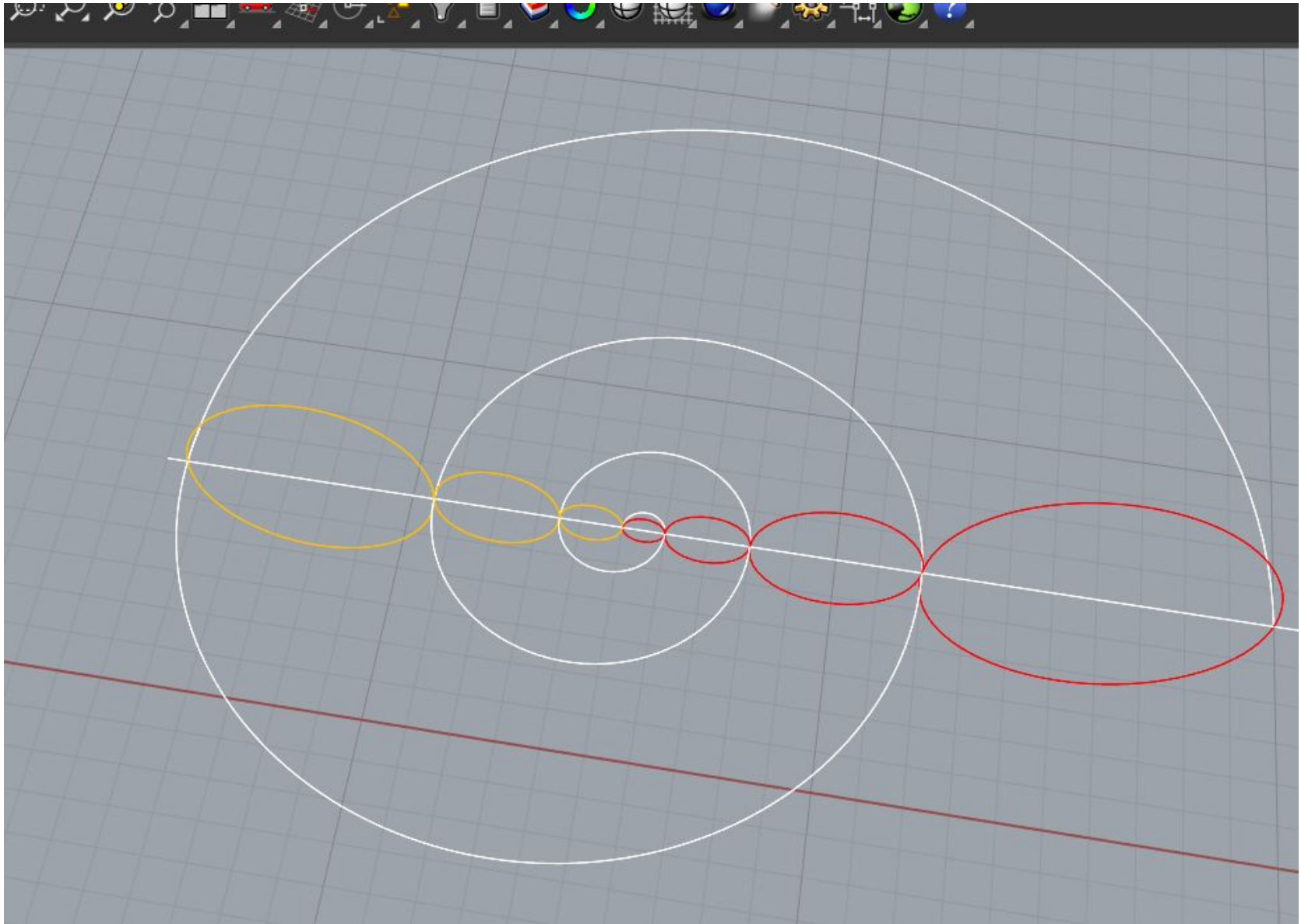
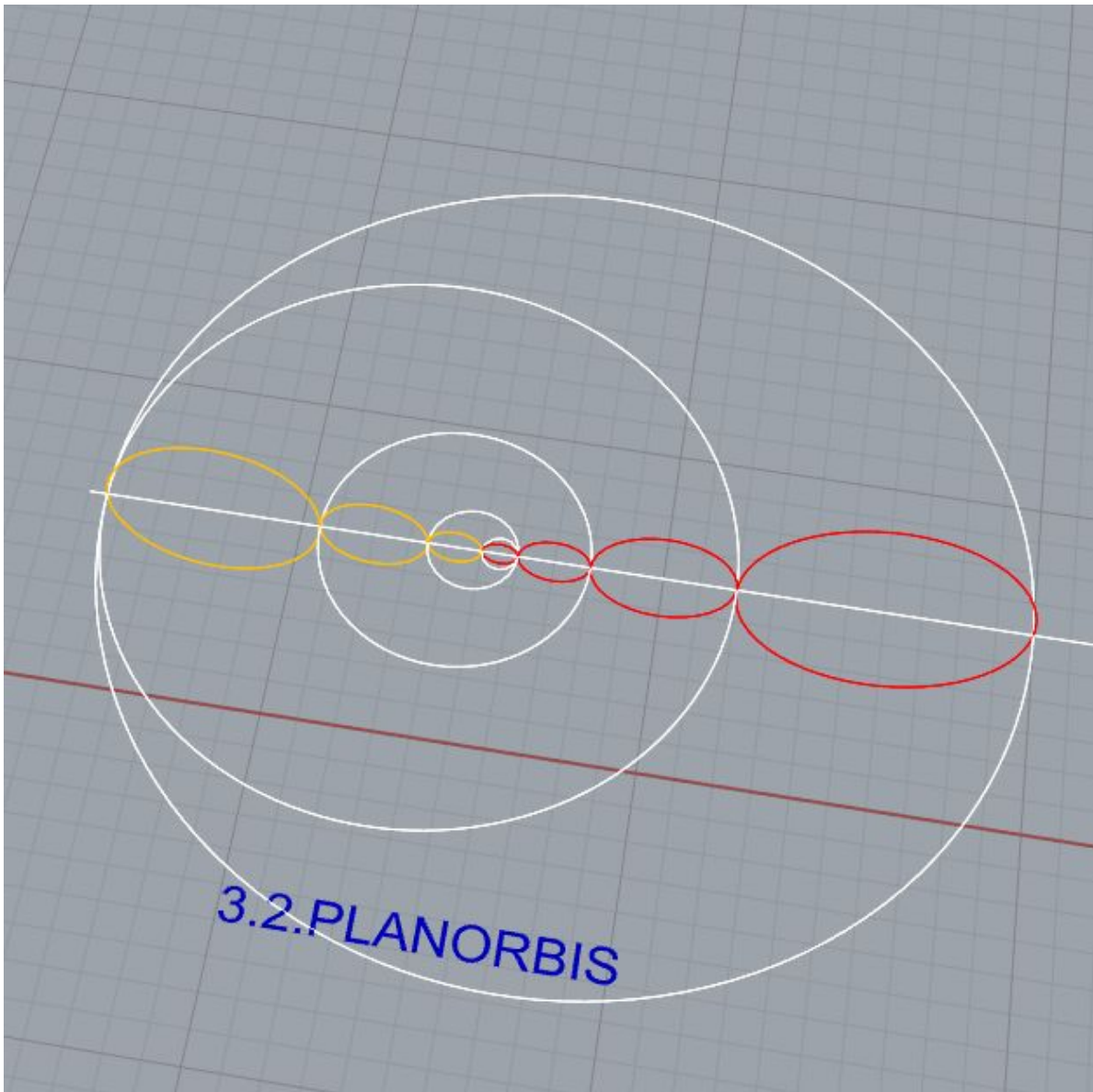
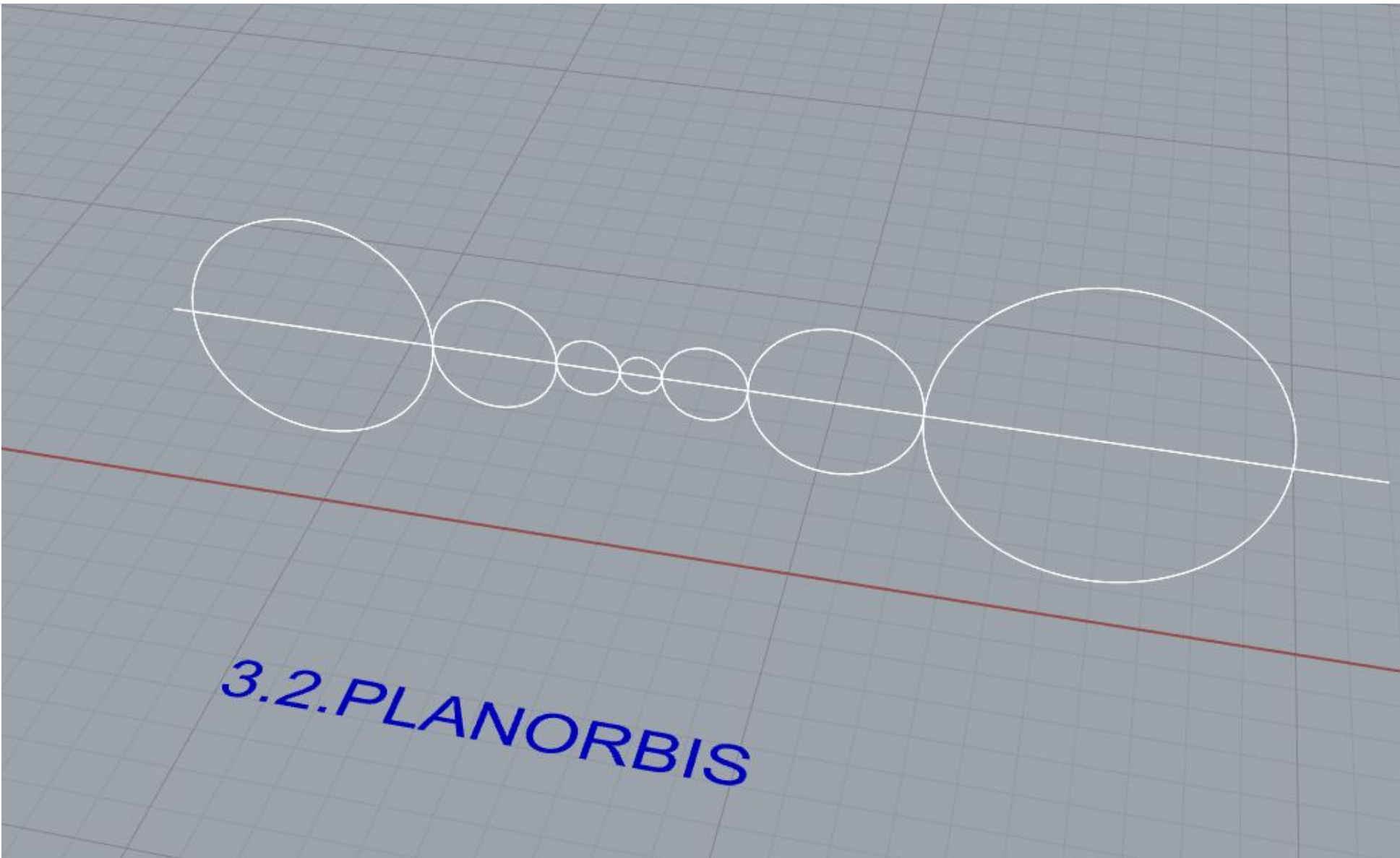
fazer dois quadrados 1 por 1,
depois 2 por 2, e sucessivamente
até ao 13 por 13



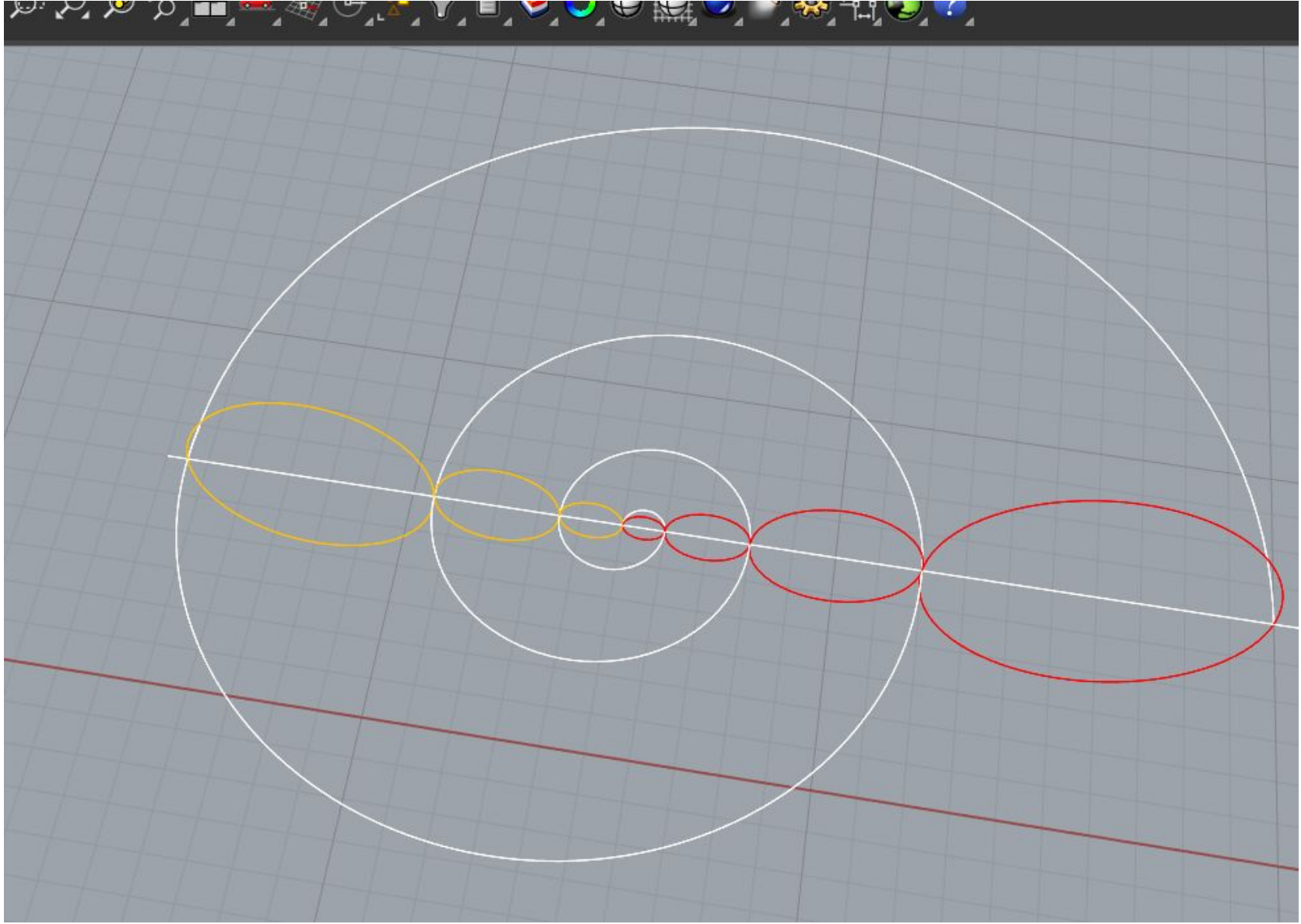
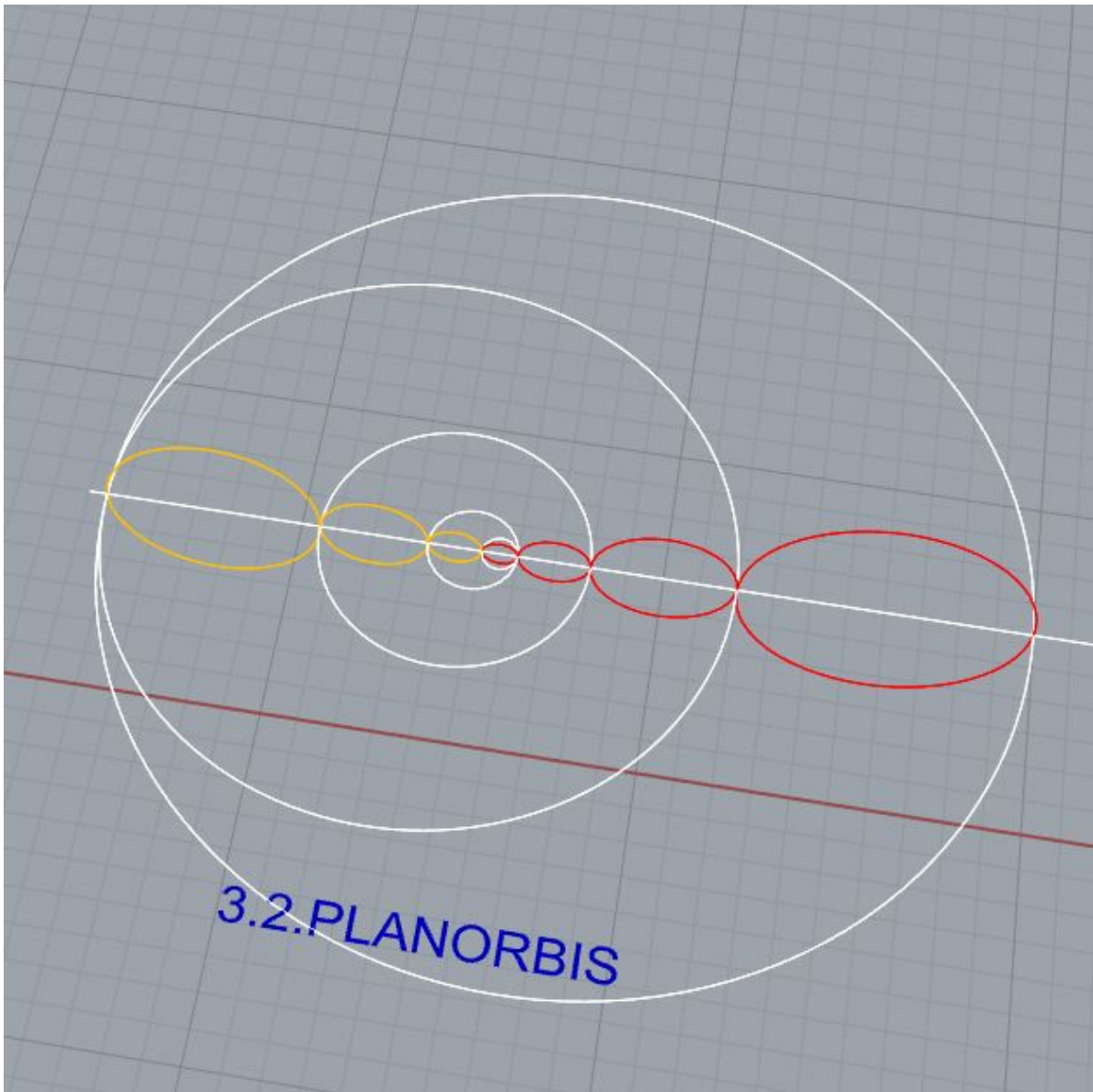
SPIRULA



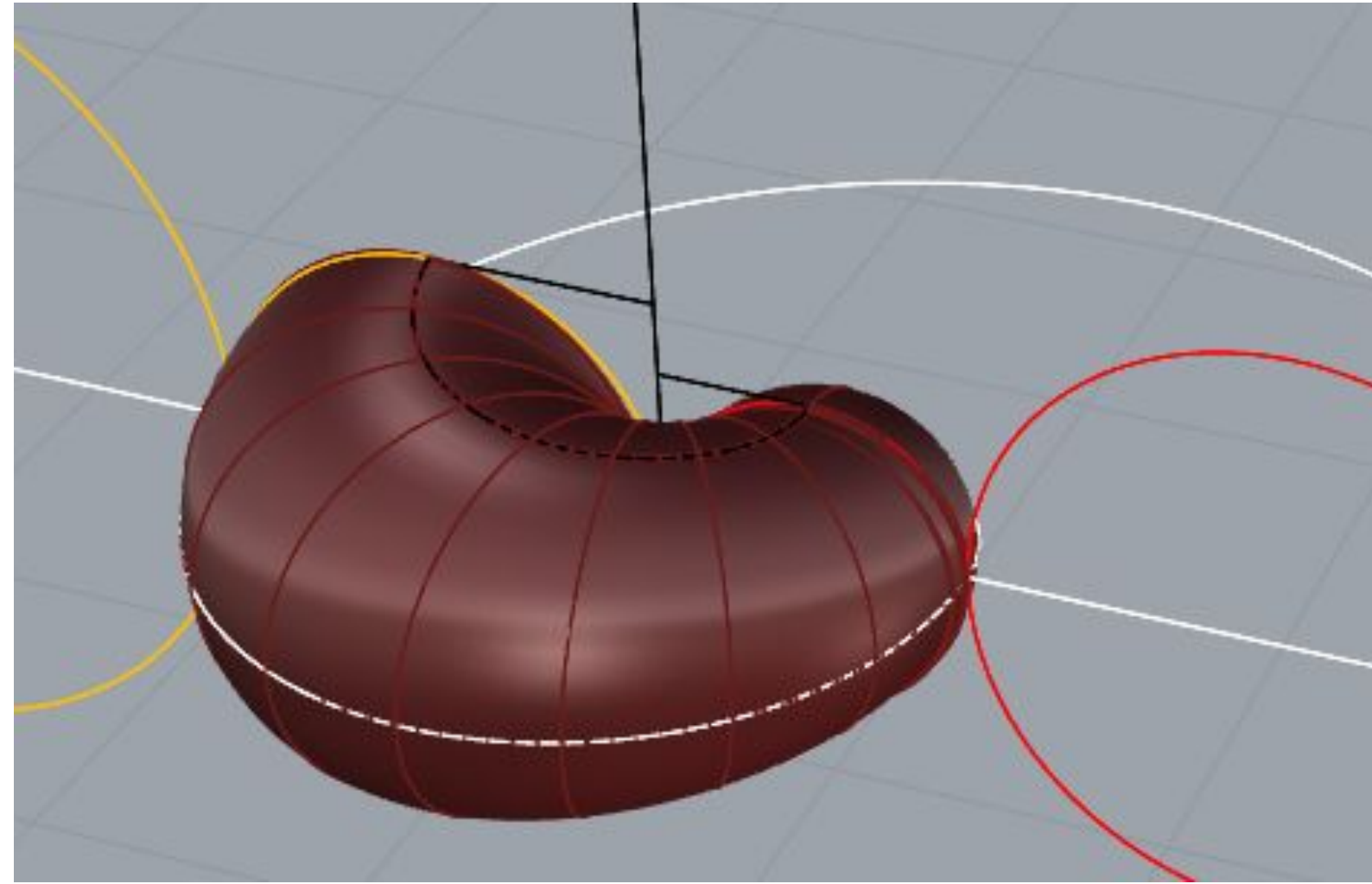
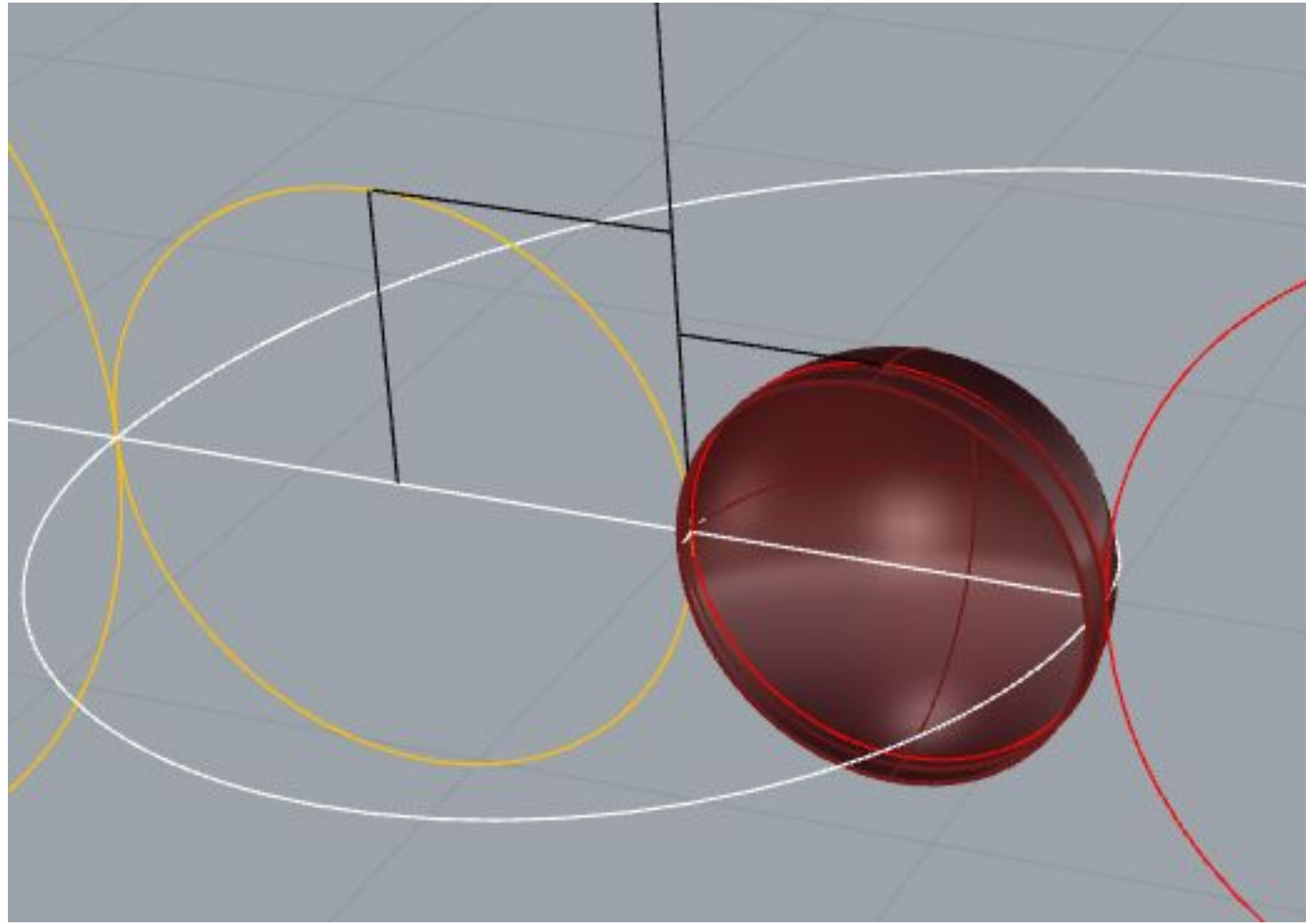
PLANORBIS



PLANORBIS



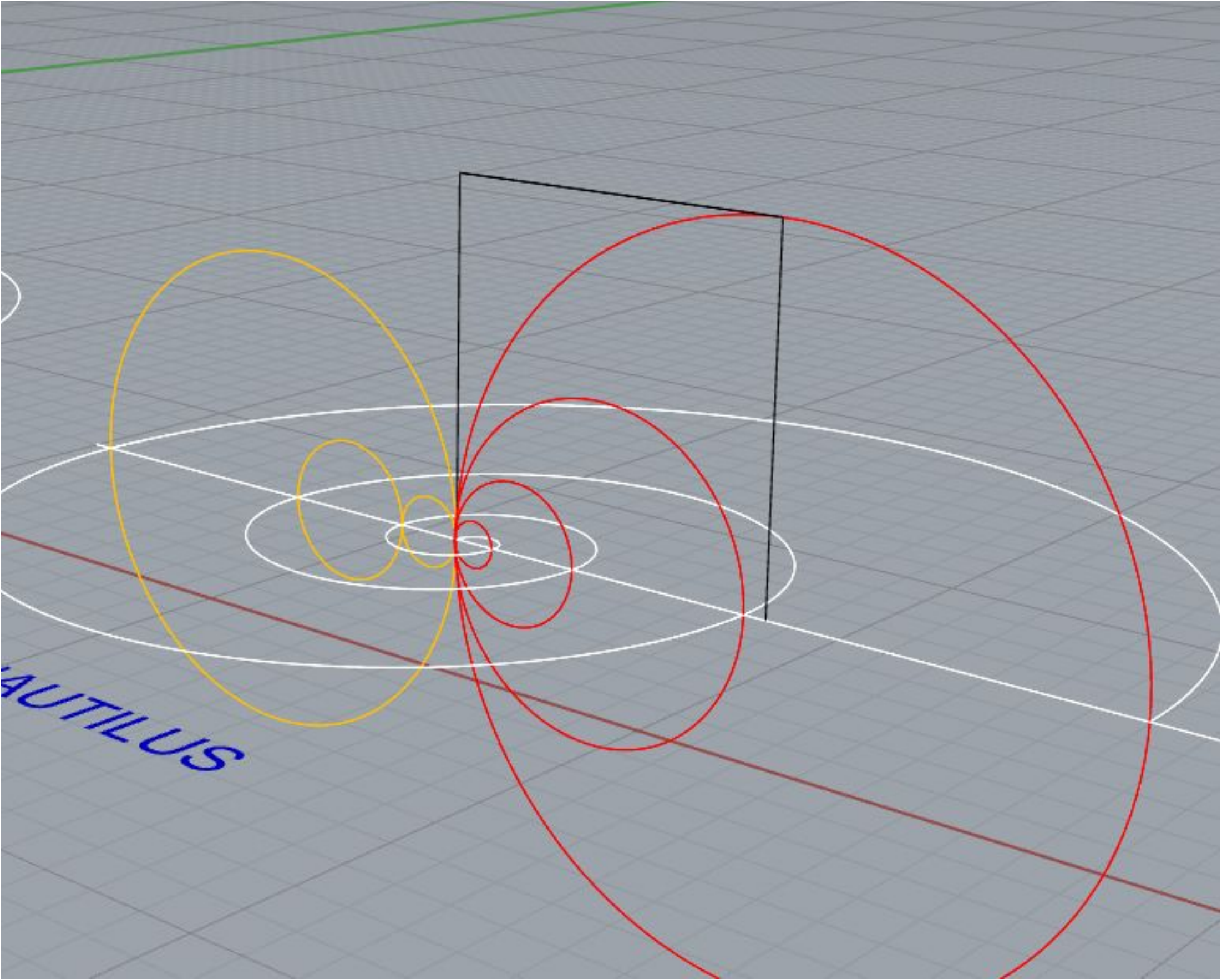
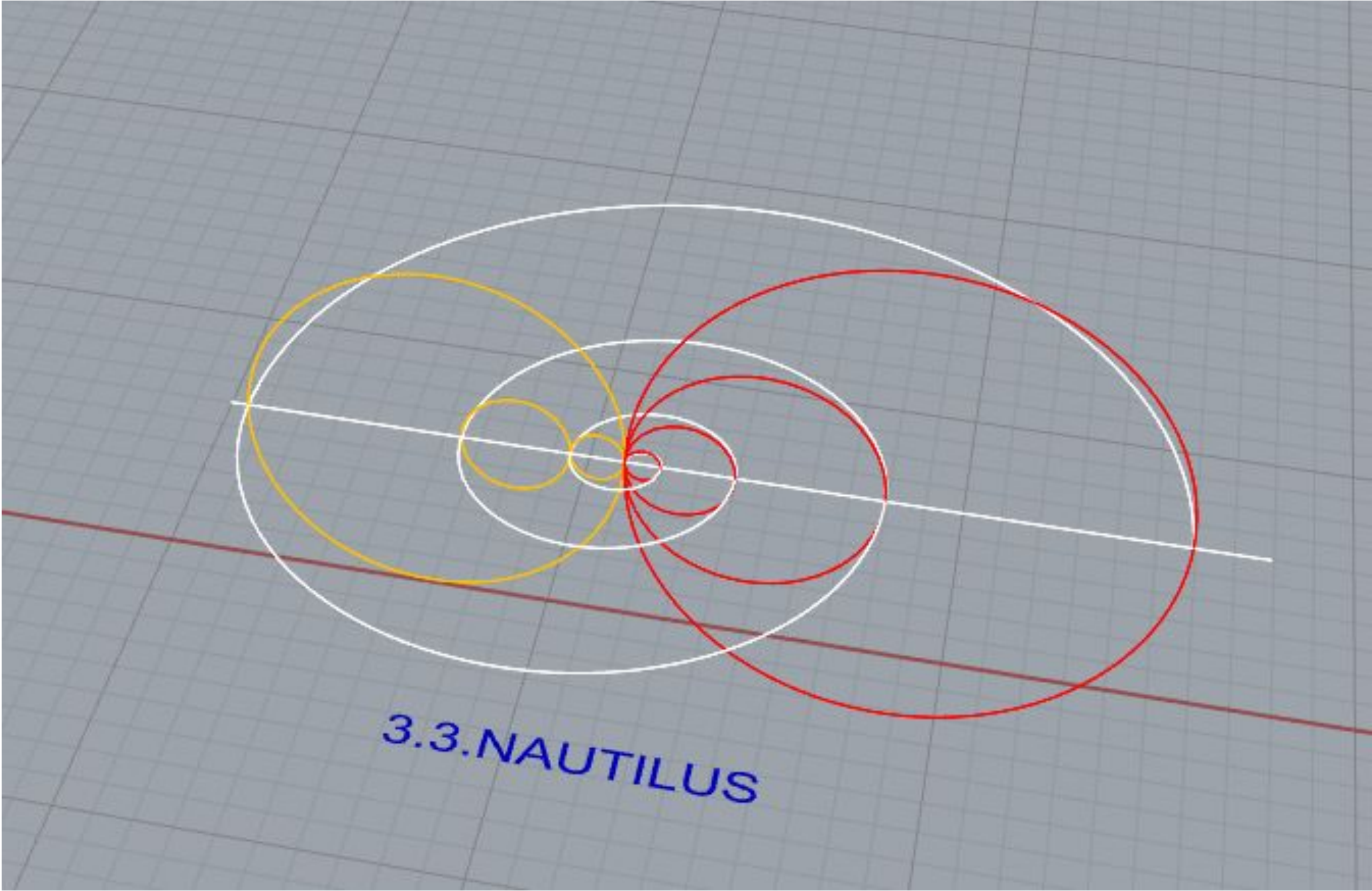
PLANORBIS



PLANORBIS

- circunferências vertical com 1,2, 4, 8 de diâmetro (LADO DIREITO) e 1,1.5, 3, 6 de diâmetro (LADO ESQUERDO), sendo o de 1 diâmetro o círculo central
- fazer circunferências com o diâmetro de 2 circunferências
- trim
- circunferência cheia no círculo do meio, trim da metade da frente
- spiral vertical
- sweep2

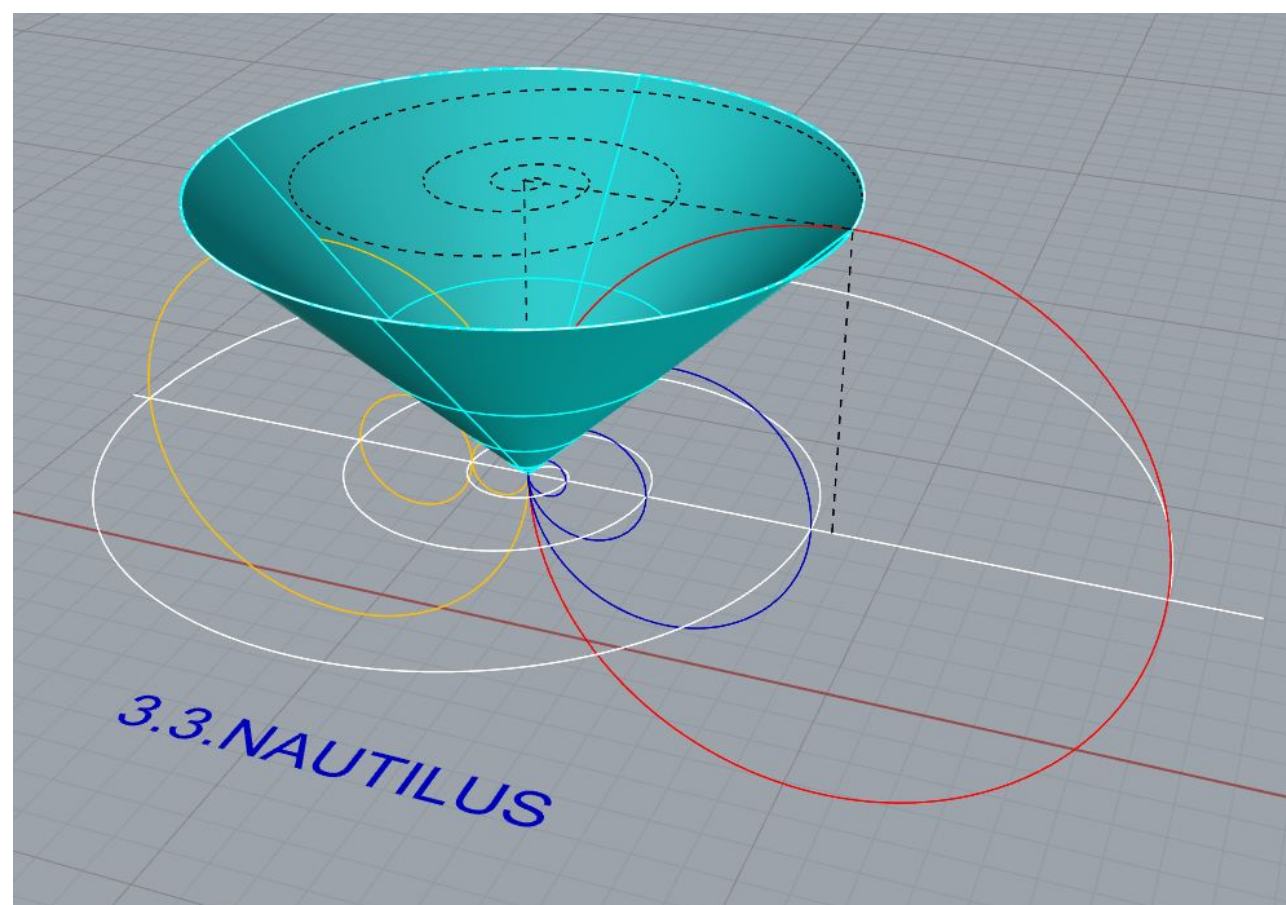
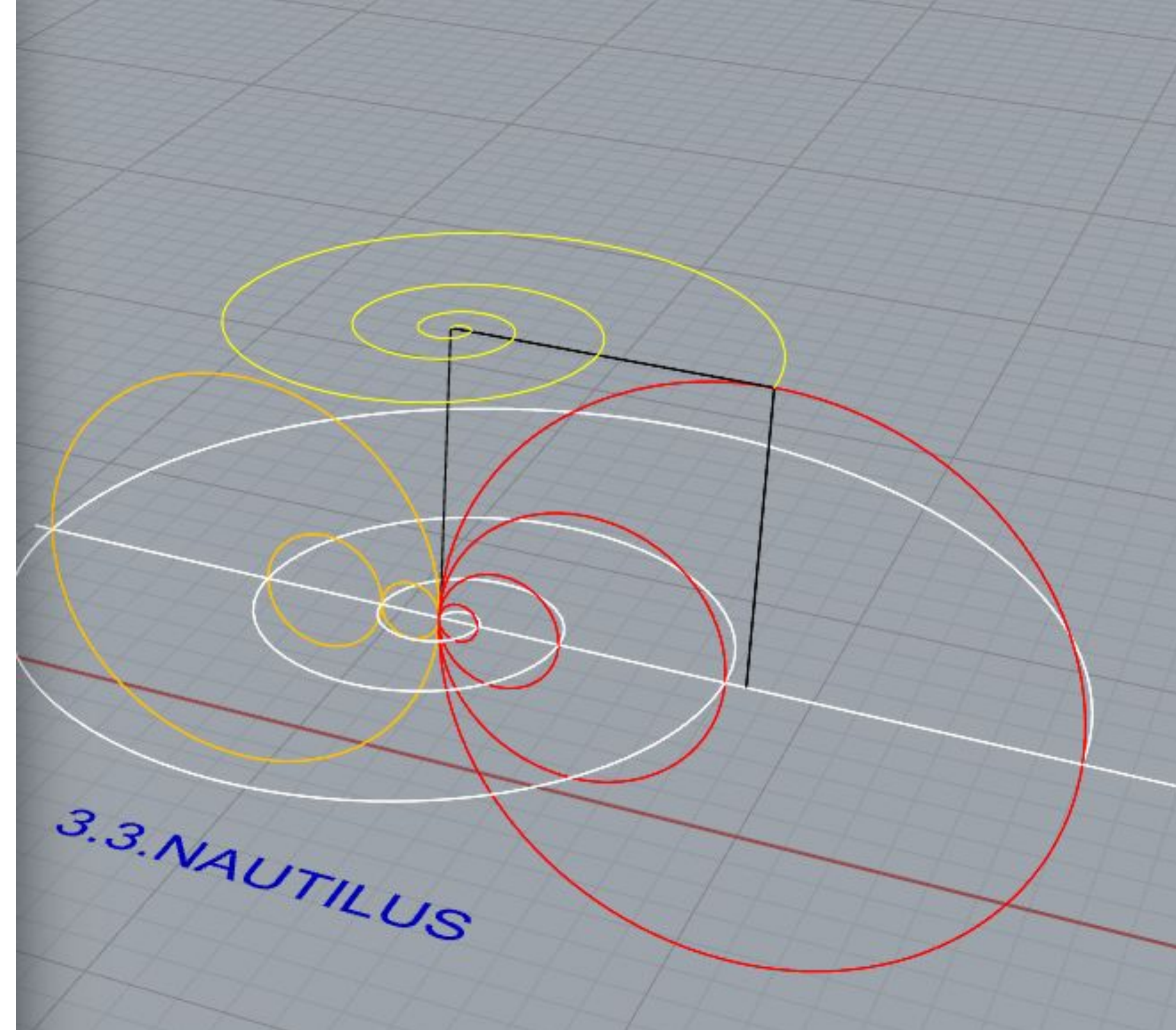
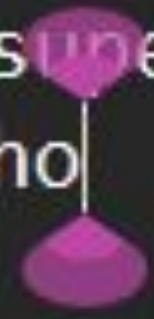
NAUTILUS



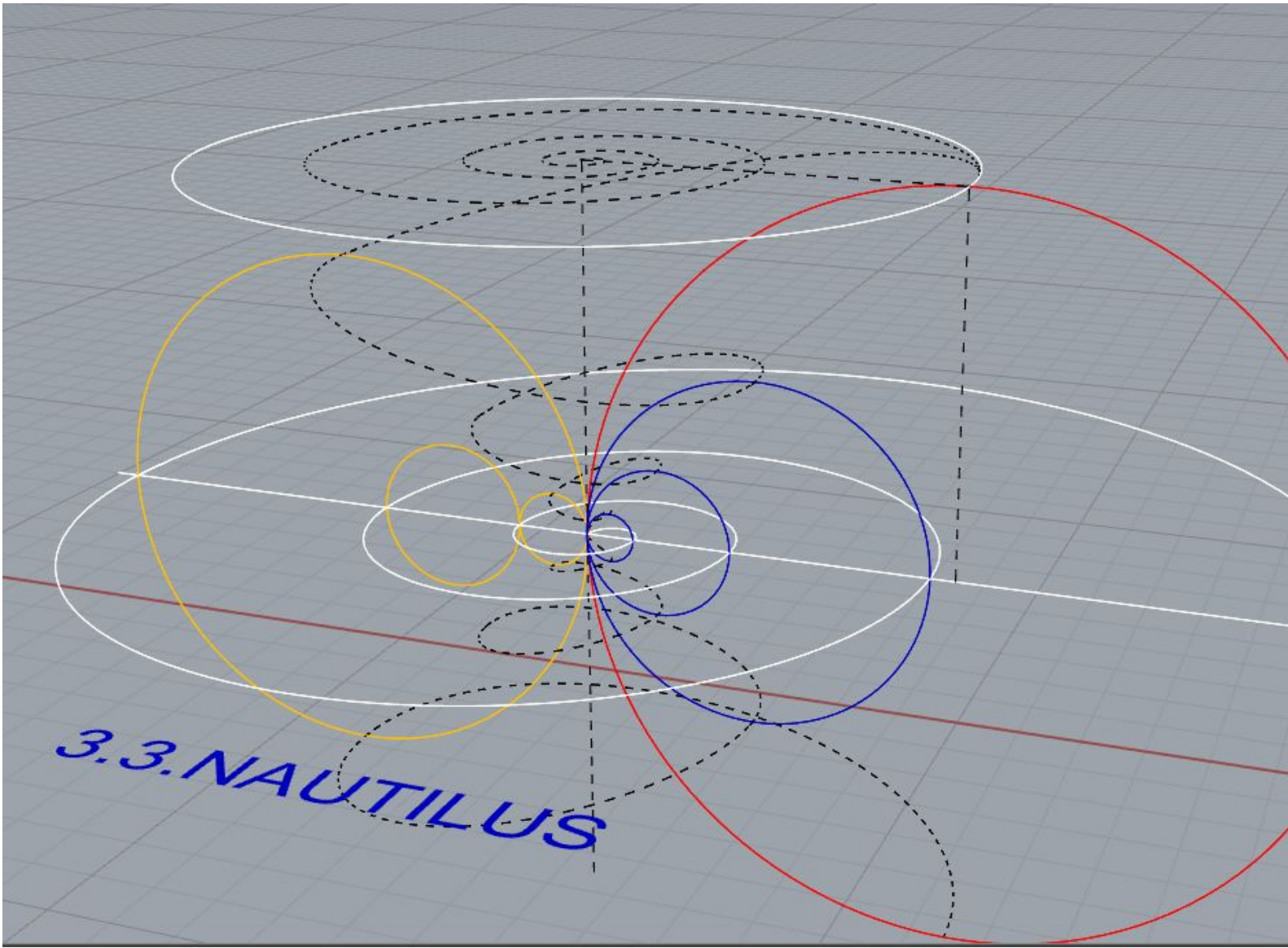
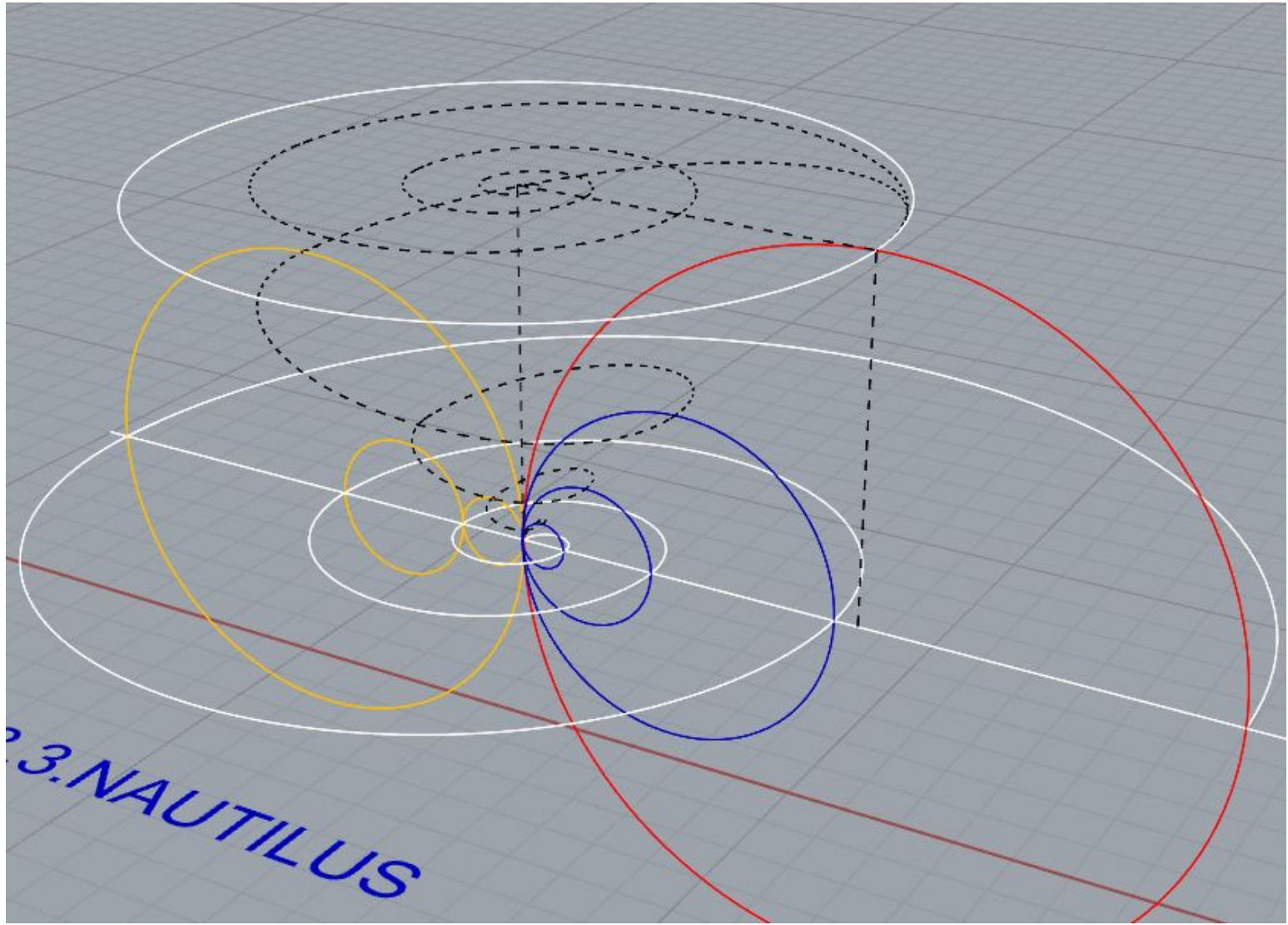
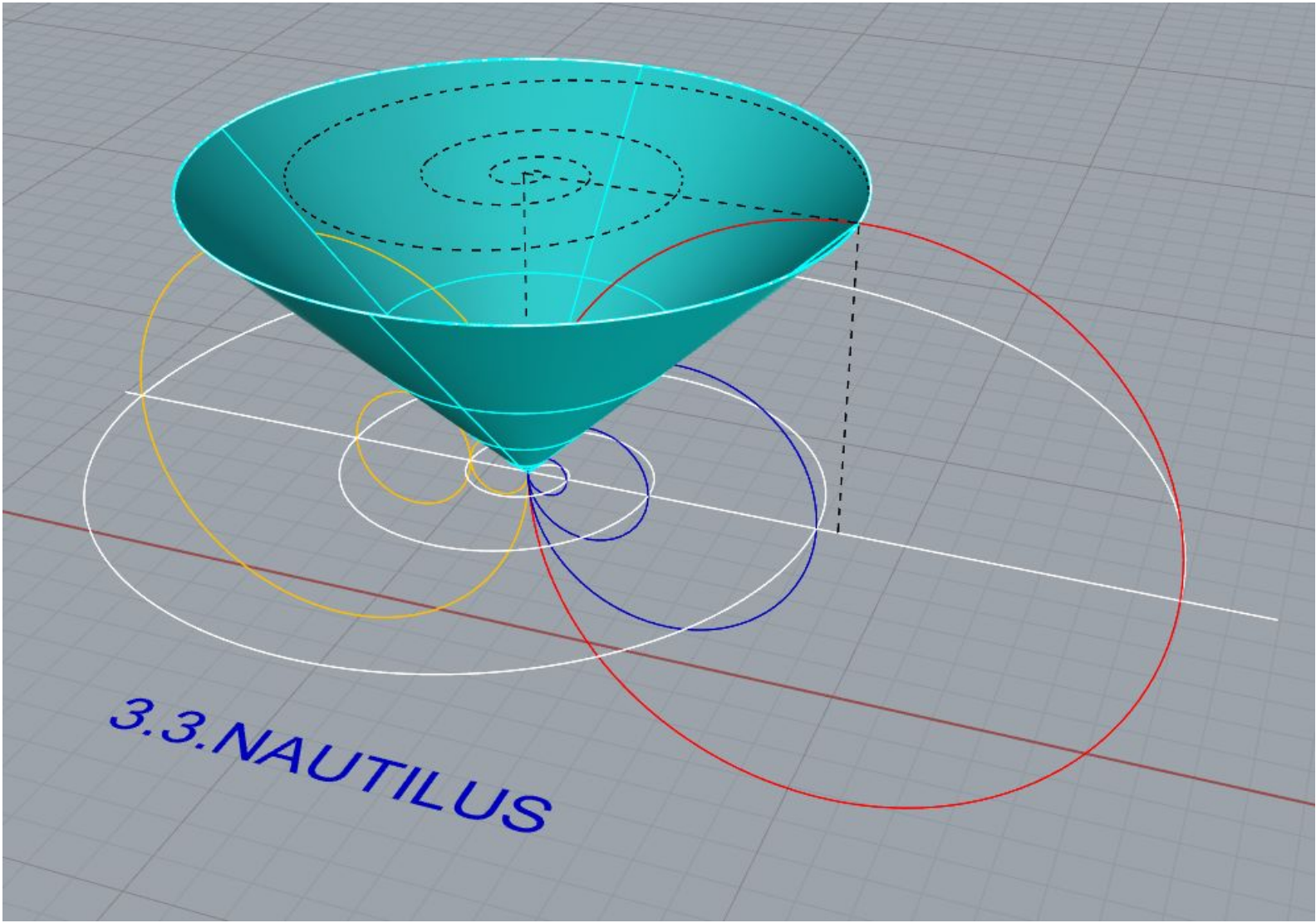
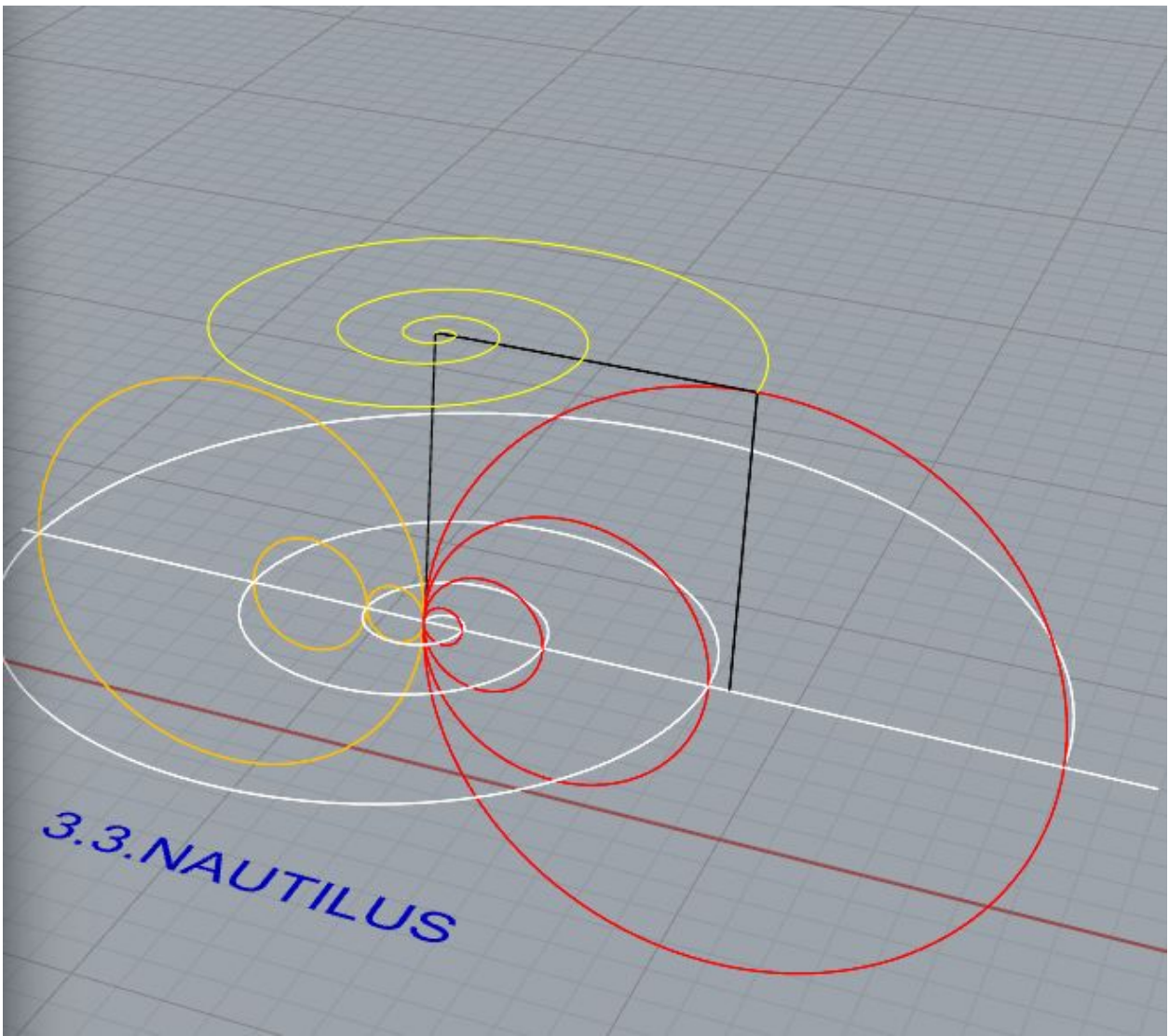
NAUTILUS

NAUTILUS

- a mesma base do planorbis e fazer círculos verticais com o mesmo ponto
- fazer linha vertical aux, no centro superior do ultimo circulo vermelho e outra a sair do ponto central de todos os circulos
- group na espiral, move vertical para cima
- scale do centro da 2 espiral superior até ao centro superior do ultimo circulo vermelho



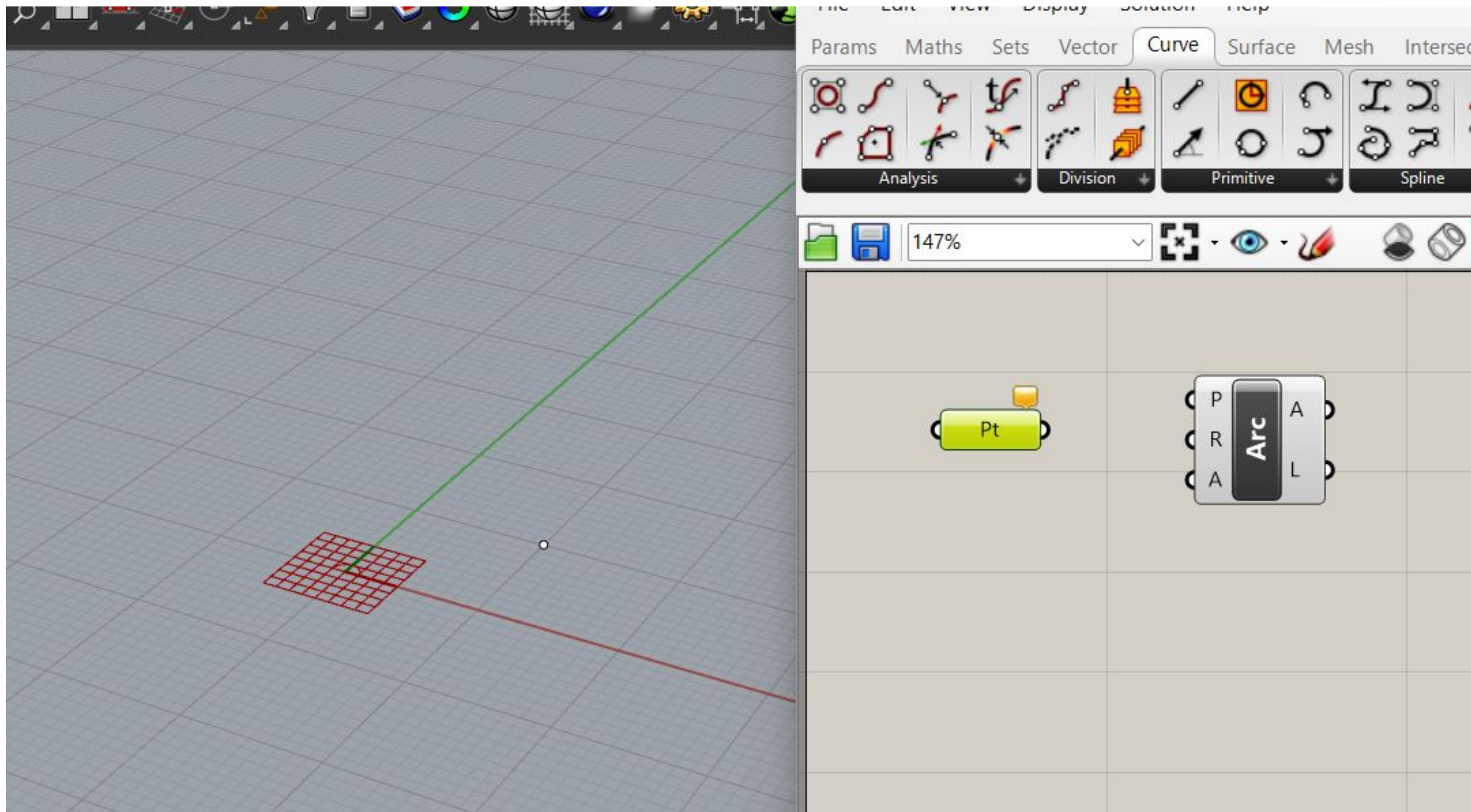
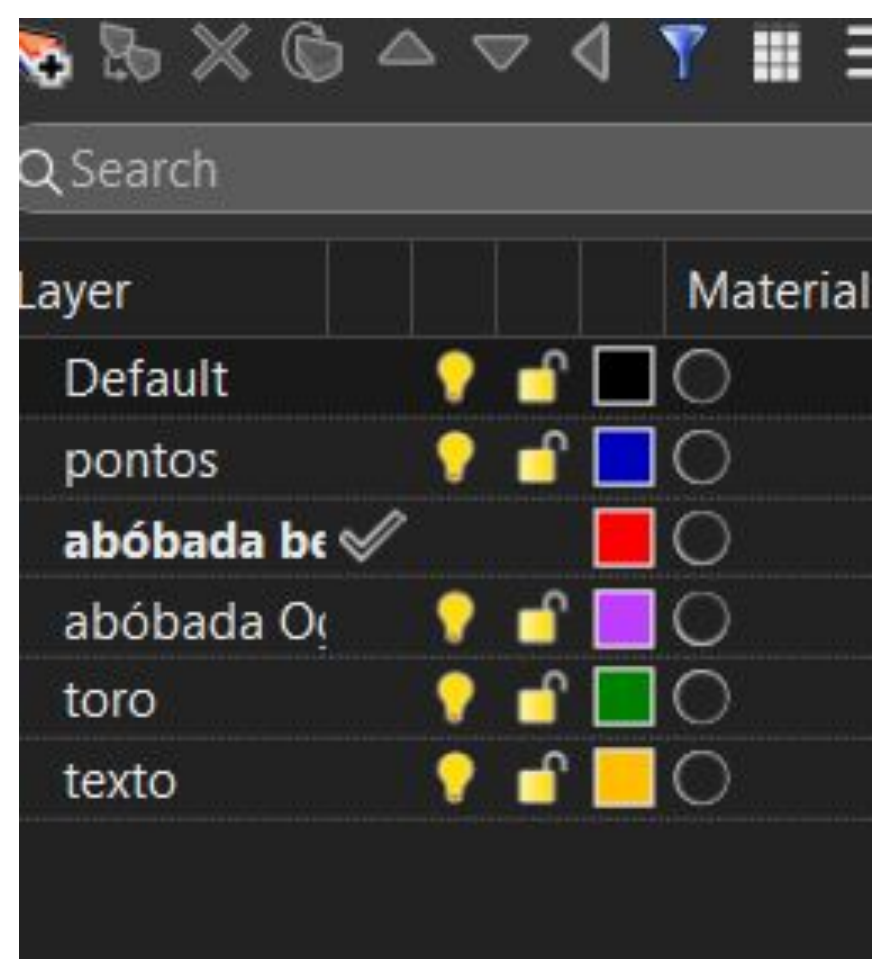
NAUTILUS

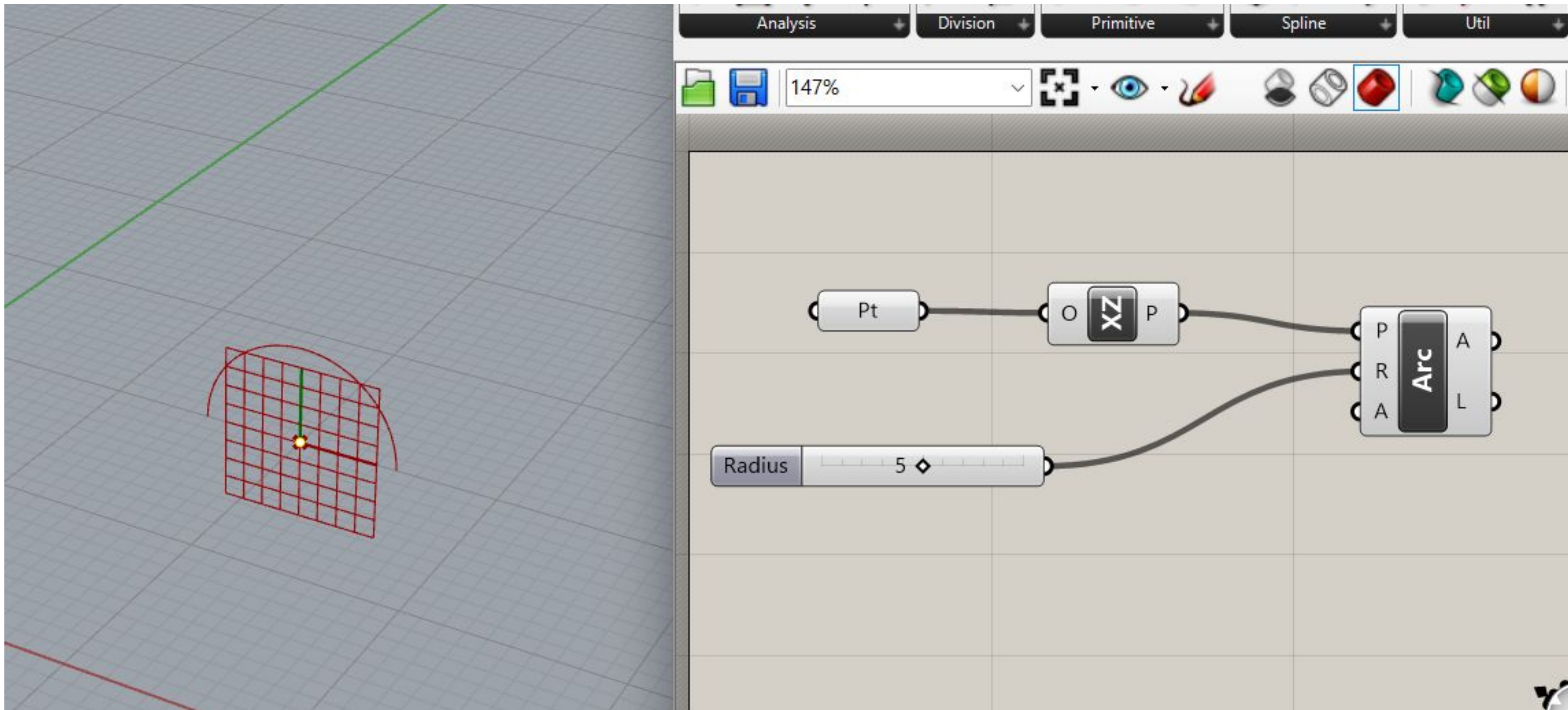


CARACOL

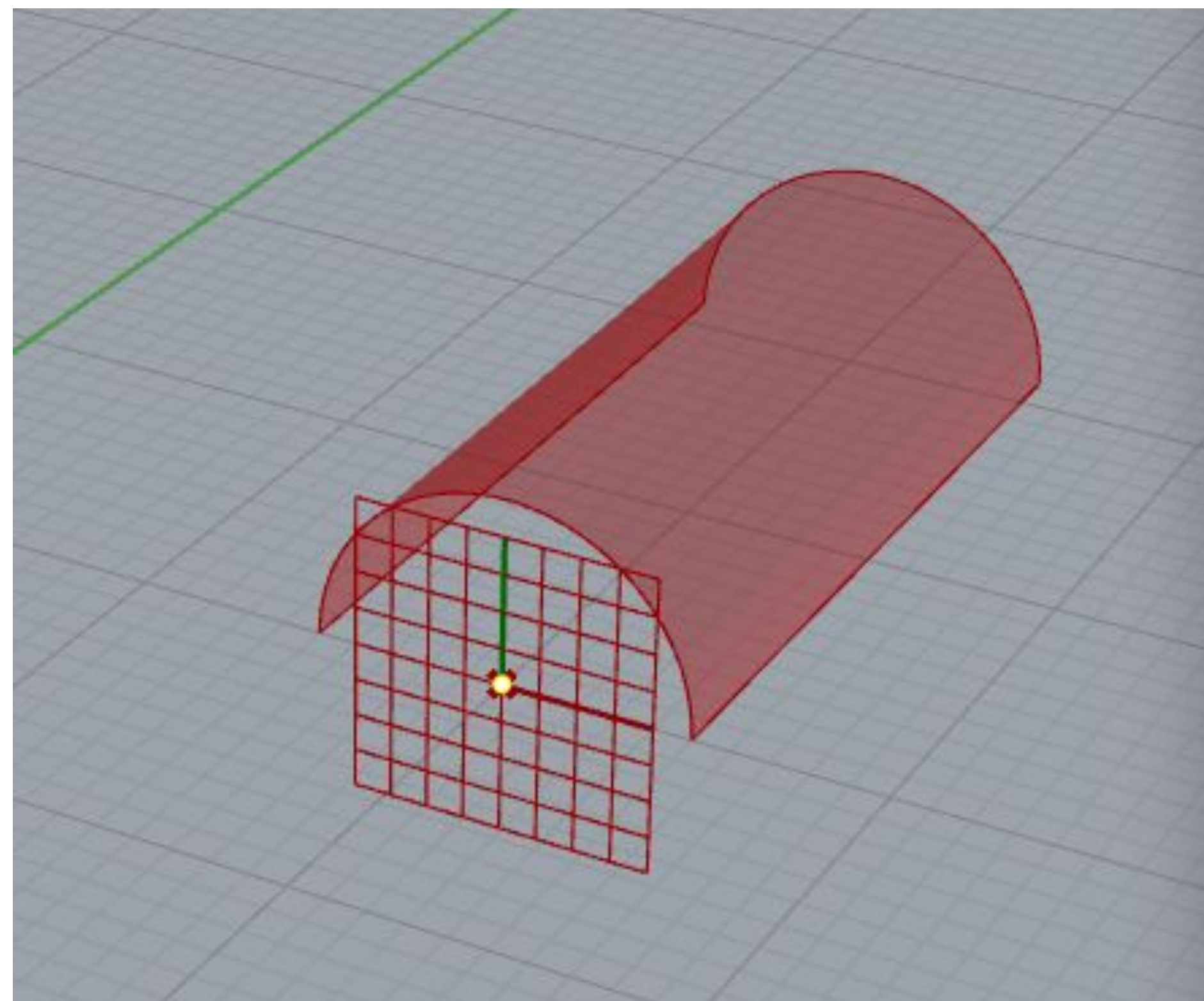
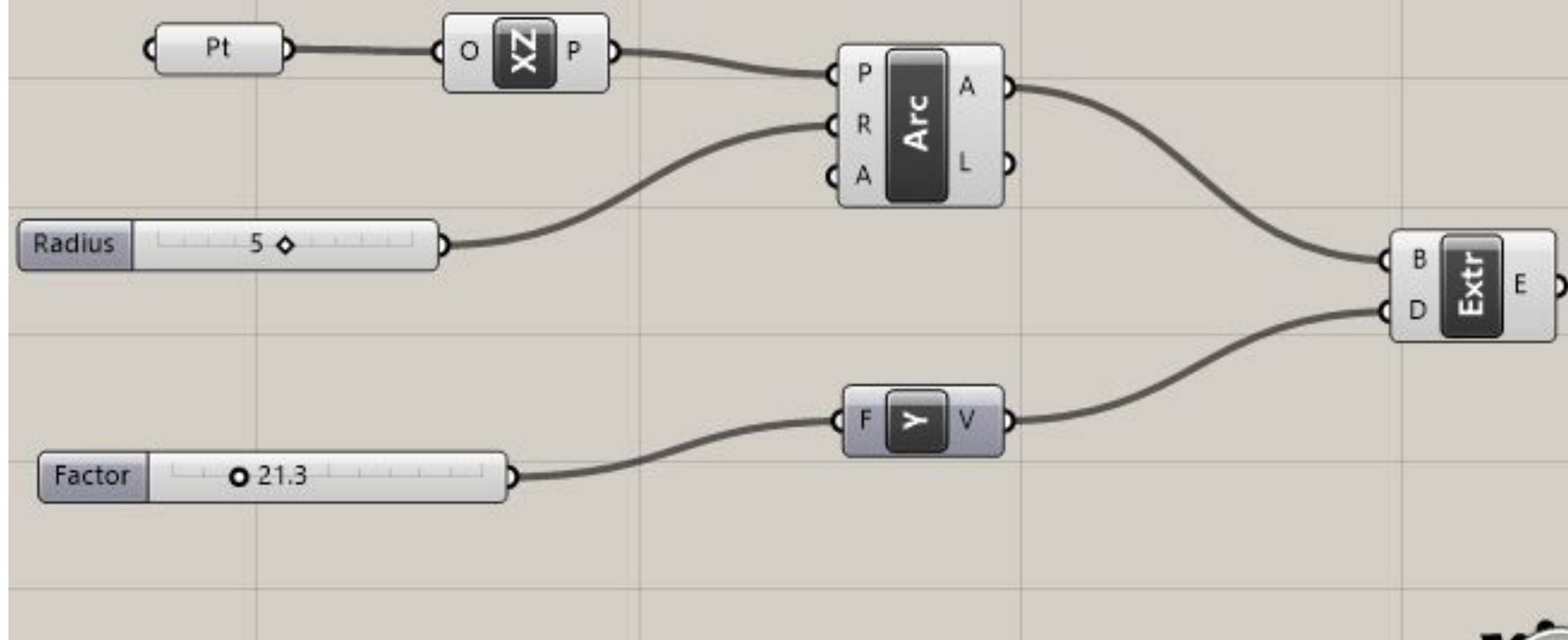
CARAMUJO DO MAR

Abóbada de Berço - GRASSHOPPER





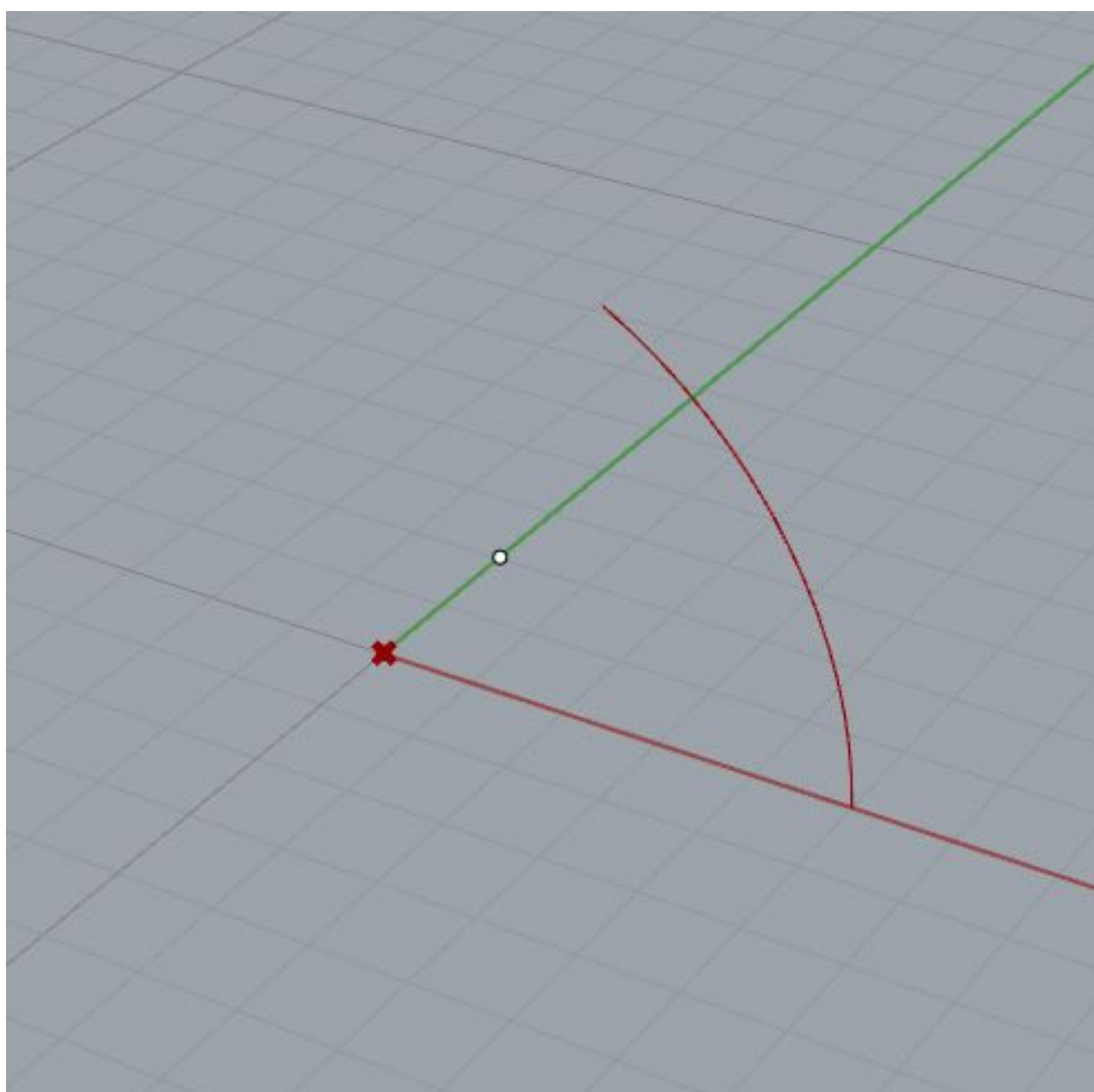
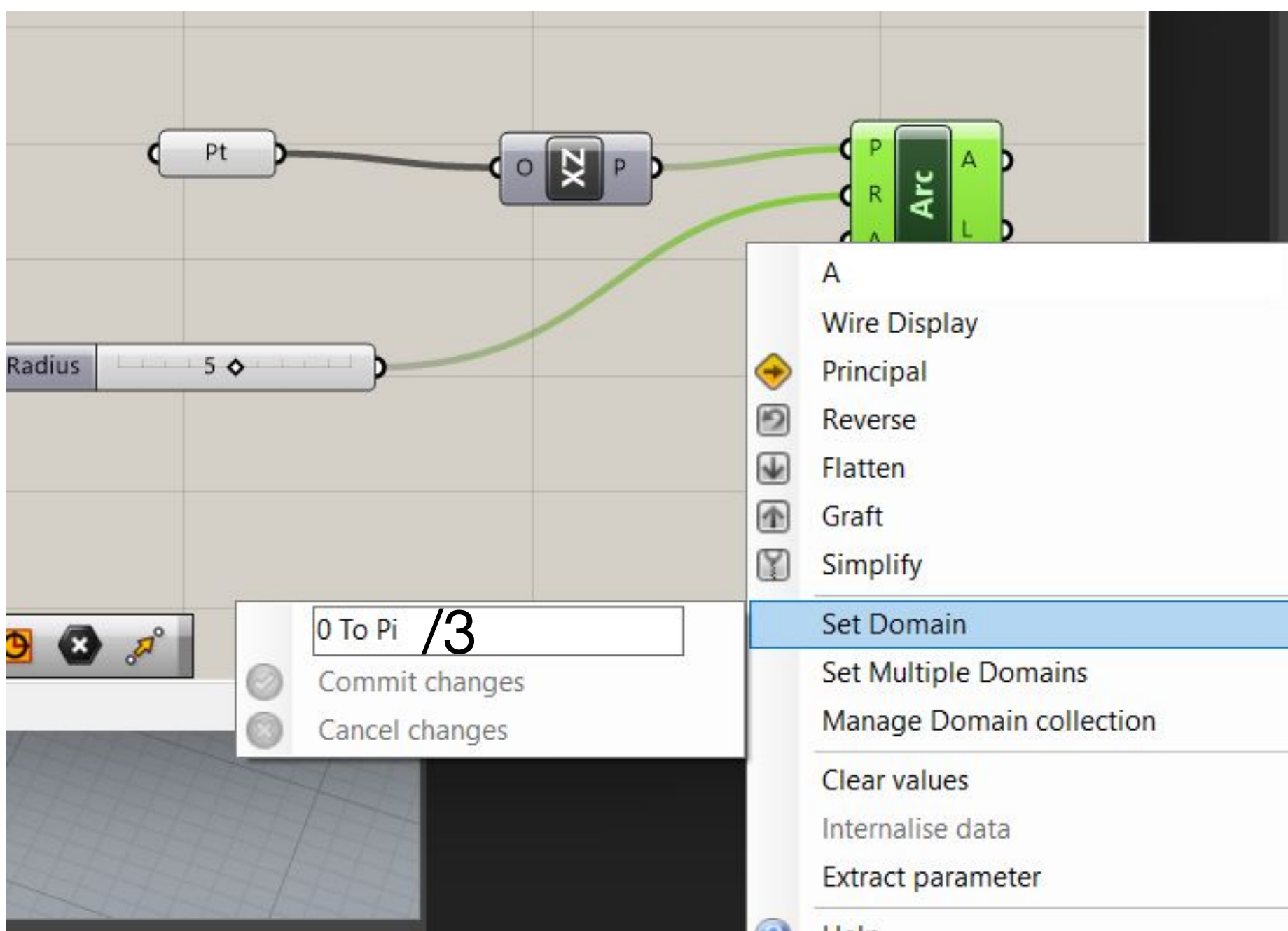
Abóbada de Berço Barrel Vault



ABOBADA DE BERÇO

- [grasshopper](#)
- [curve](#), [primitive](#), [arc](#)
- carregar 2x na tela, point
- na perspectiva, ponto com @10,10
- selecionar o ponto na perspectiva, depois na tela, botão [dir](#), do rato "set [one point](#)"
- carregar 2x, plano XZ, em cima com botão [dir](#), preview (desativa a grelha)
- carregar 2x, 5
- [scribble properties](#), para escrever textos
- carregar 2x, extrude
- carregar 2x, [unit Y](#)
- carregar 2x, 21.3

Abóbada de Ogiva - GRASSHOPPER

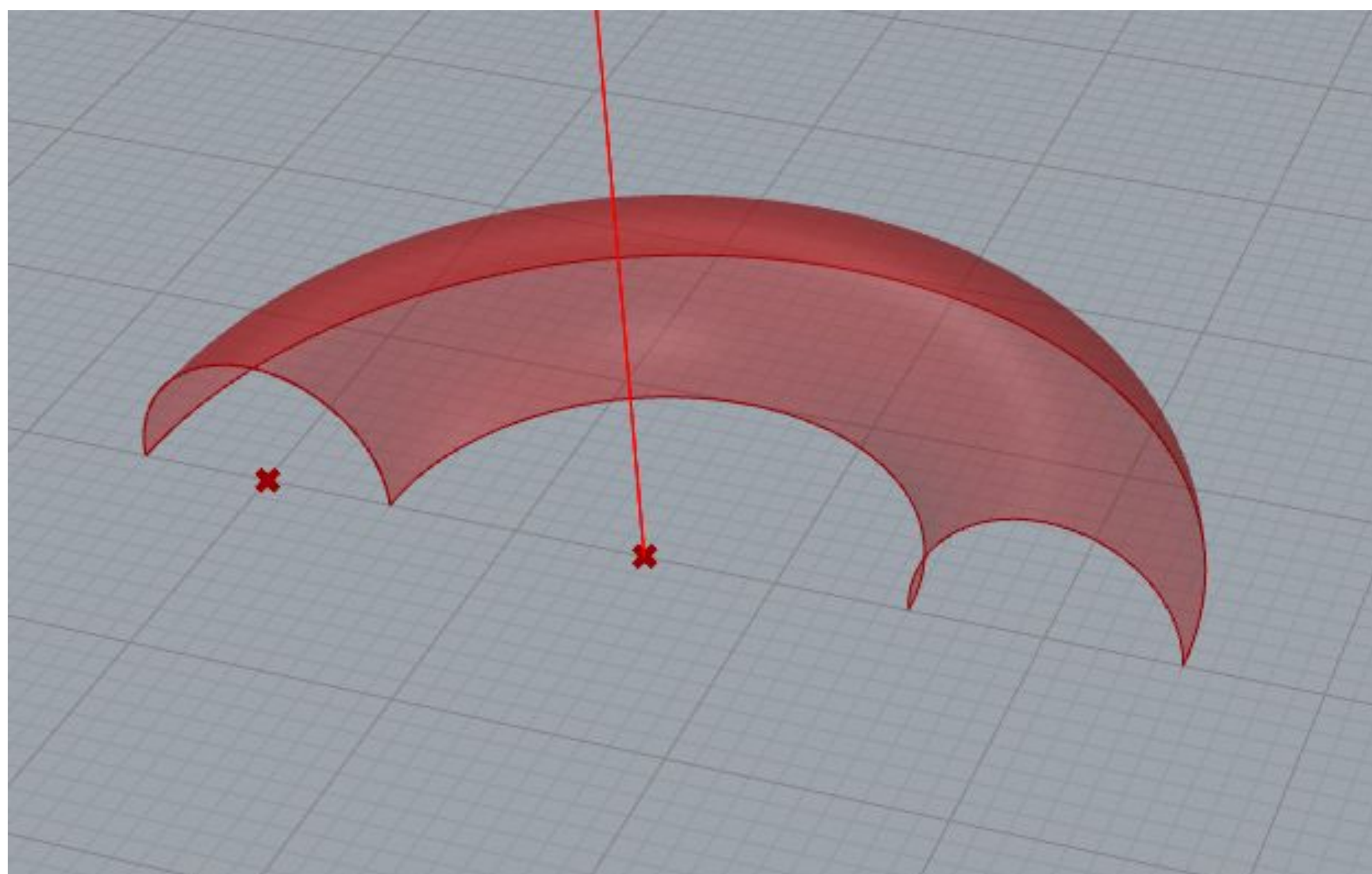
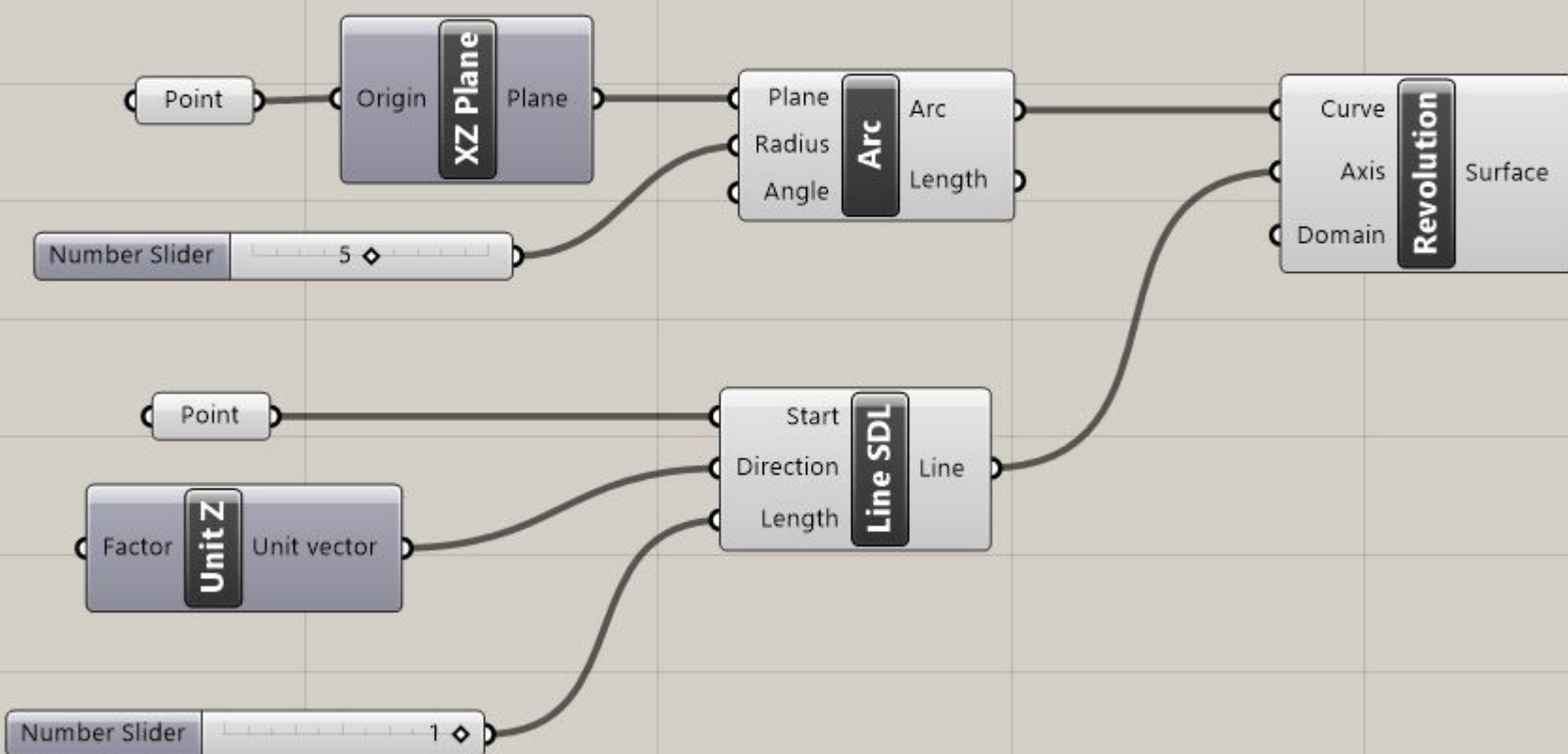


ABOBADA De ogiva

- grasshopper
- curve, primitive, arc
- carregar 2x na tela, point
- na perspectiva, ponto
- selecionar o ponto na perspectiva, depois na tela, botão dir, do rato "set one point"
- carregar 2x, plano XZ, em cima com botão dir,, preview (desativa a grelha)
- carregar 2x, 5
- carregar botão dir em cima do "A" do arc, "set domain" "0 to Pi /3"
- carregar 2x, plano XZ
- carregar 2x, arc

Abóbada TORAL- GRASSHOPPER

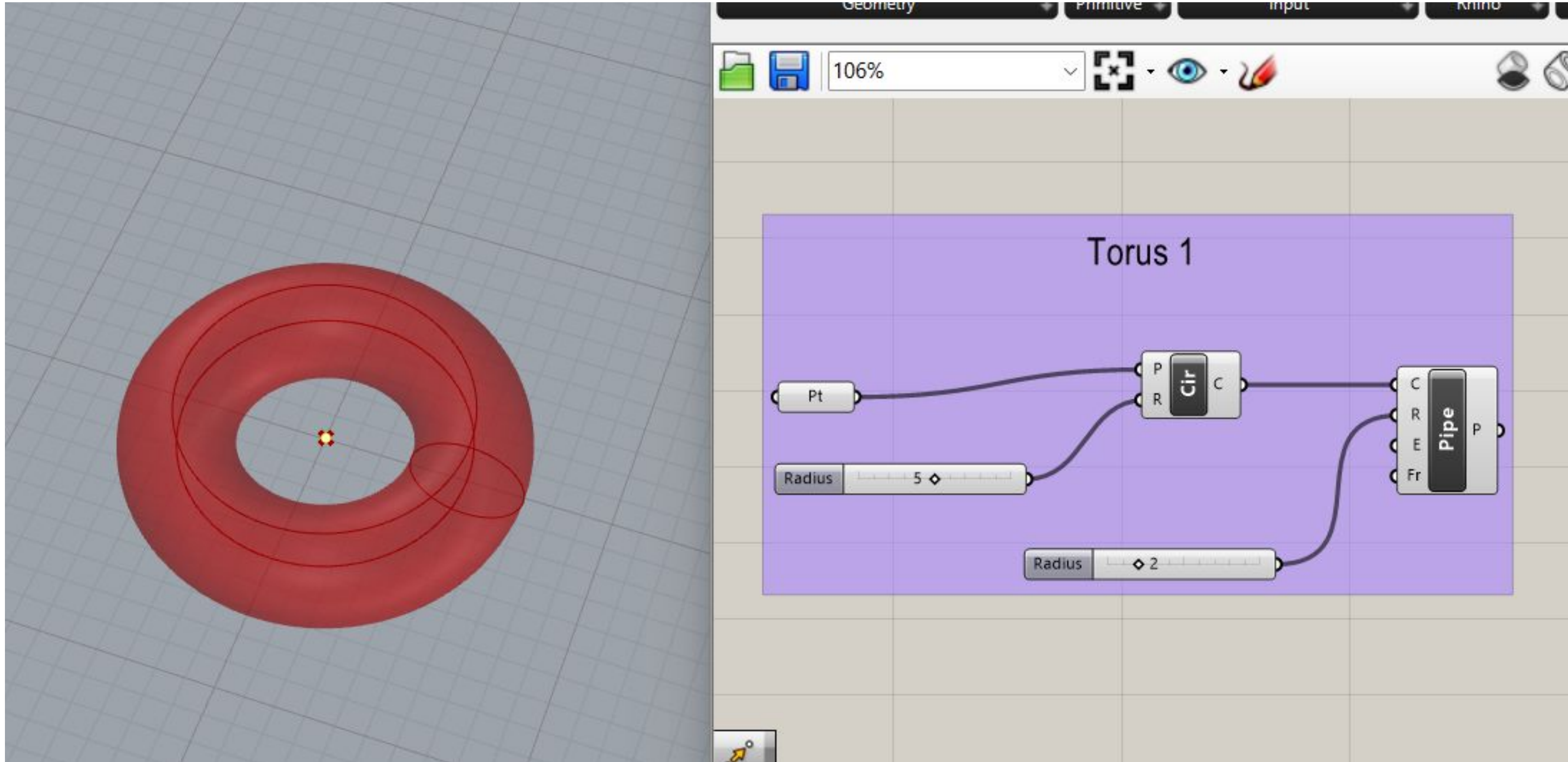
ABÓBADA TORAL



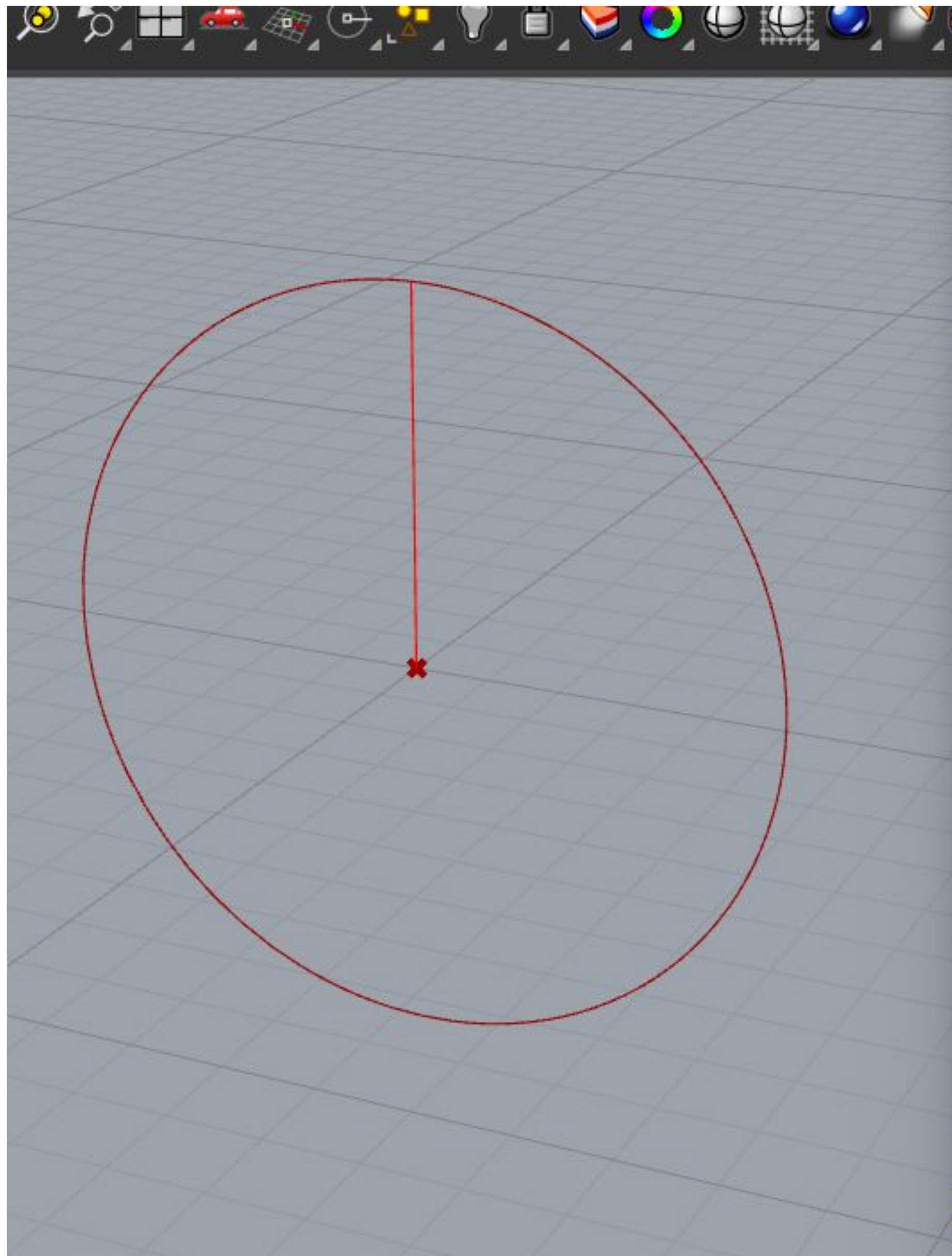
ABÓBADA toral - GRASSHOPER

- marcar um ponto (set on point)
- xz plane (preview)
- arc
- slider com 5 e ligar ao radius do arc
- criar outro ponto, set on point
- na perspectiva criar um aline vertical com origem no ultimo ponto, altura uma qualquer
- line sdl
- unit z
- slider com 1
- Revolution, botão dir. no "DOMAIN", "set domain", mudar para "Pi to 0"

Toro - GRASSHOPPER



- TORO
- torus 1
- point
 - carregar 2x, 5
 - circ
 - pipe
 - carregar 2x, 2 (radius)



Params Maths Sets Vector Curve Surface Mesh Intersect Transform

Geometry Primitive Input Rhino

106%

Pt Radius 5 Cir Pipe

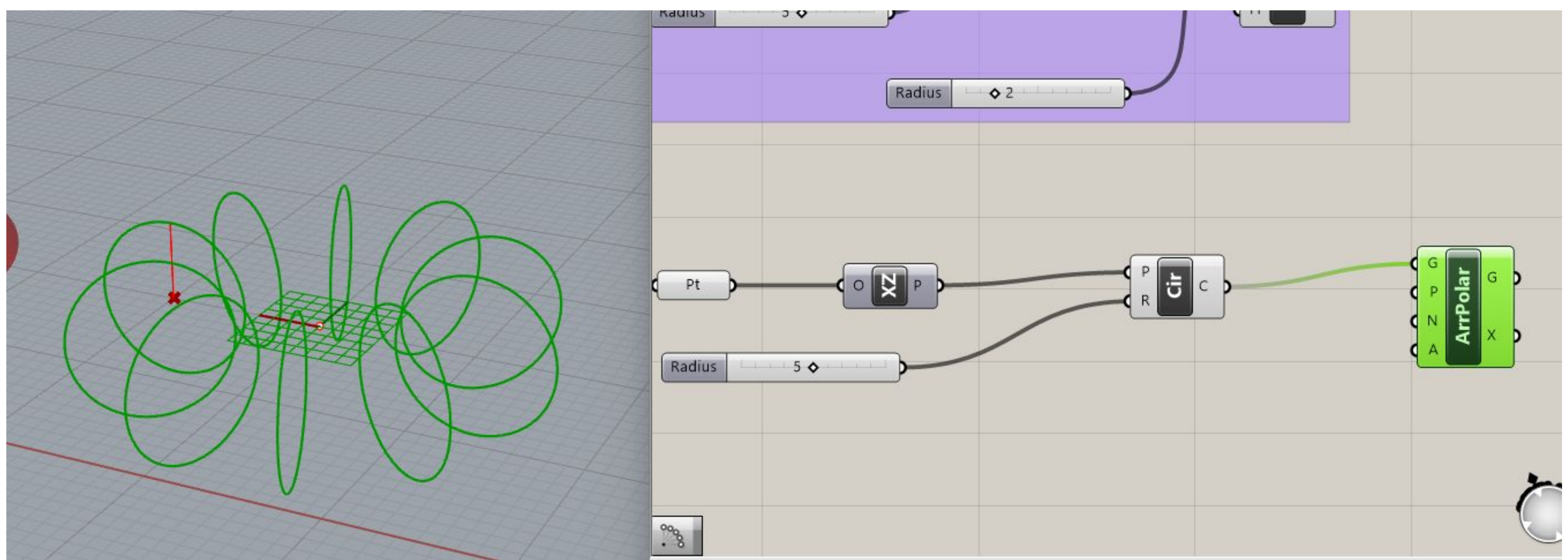
Radius 2

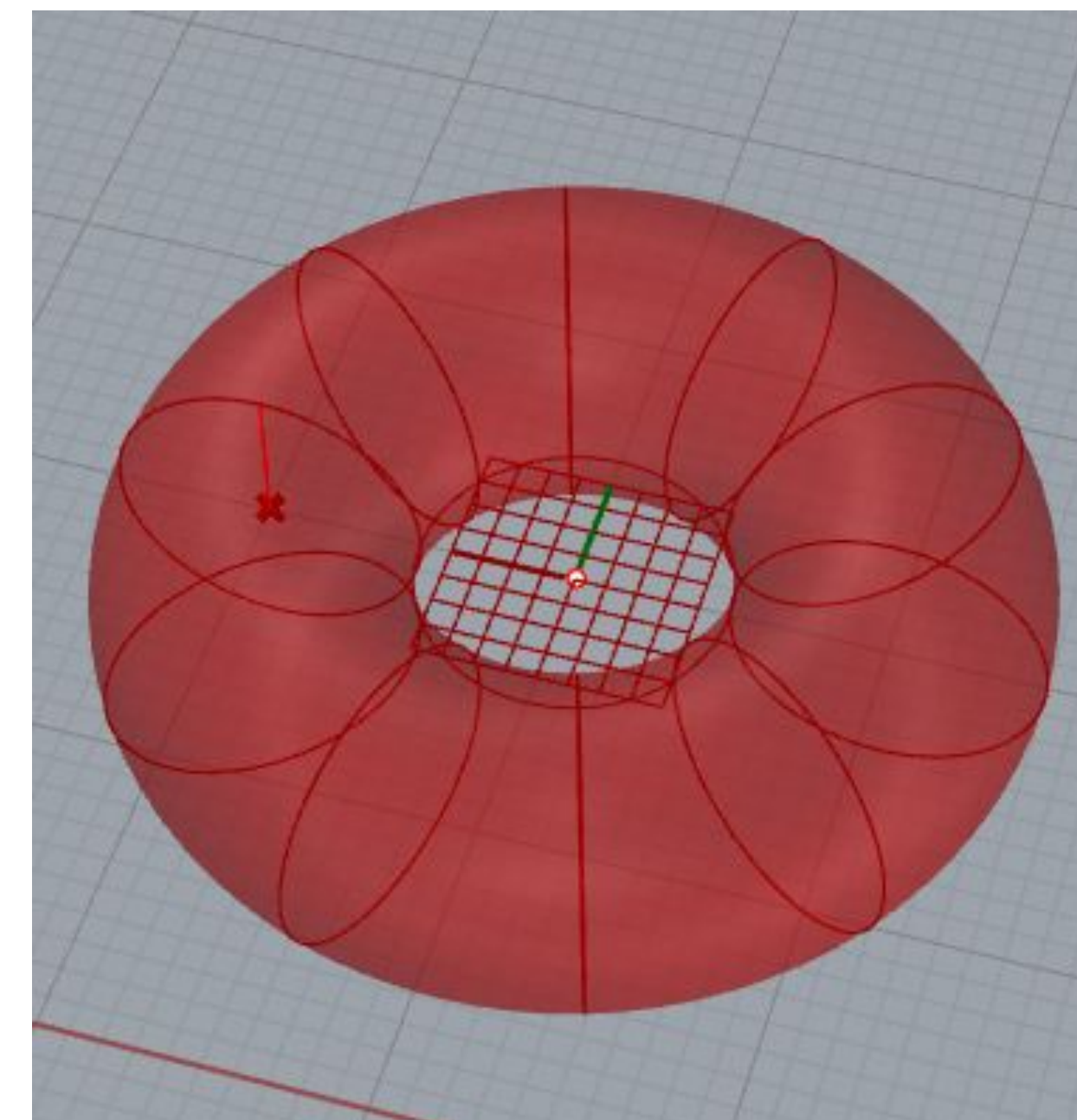
Pt XZ P Cir

Radius 5

Autosave complete (60 seconds ago)

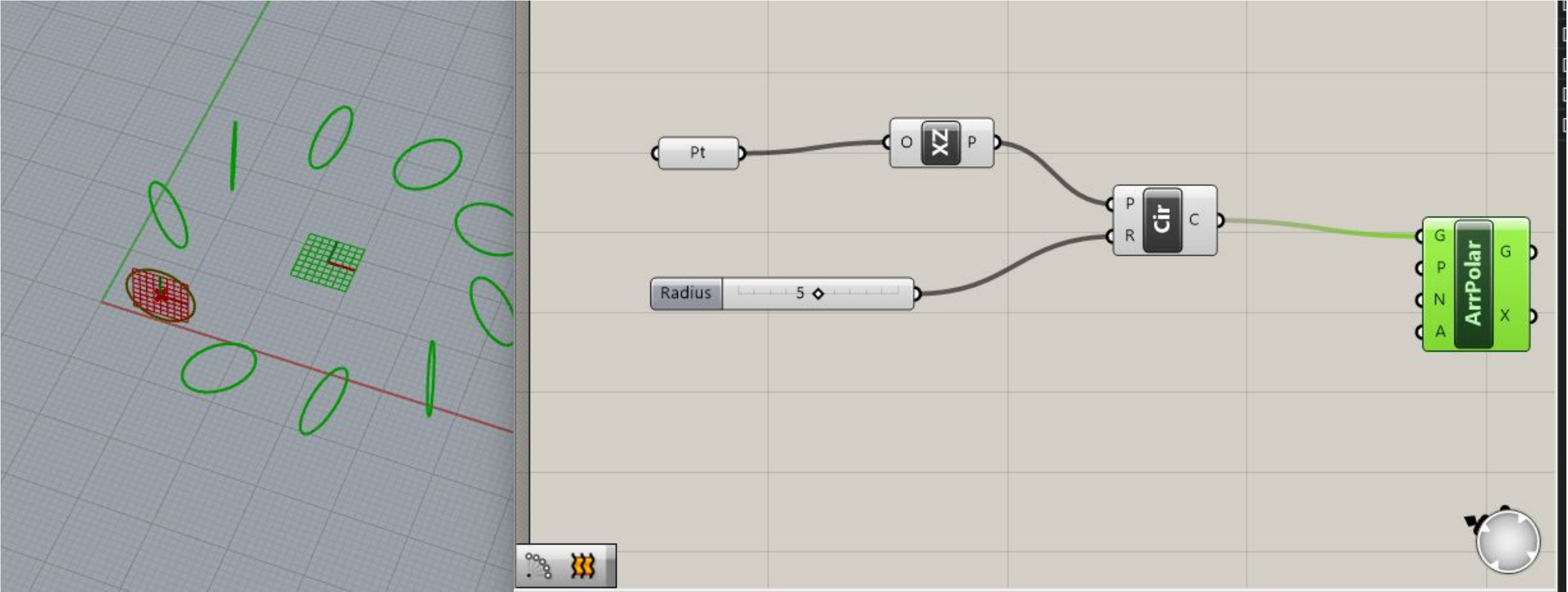
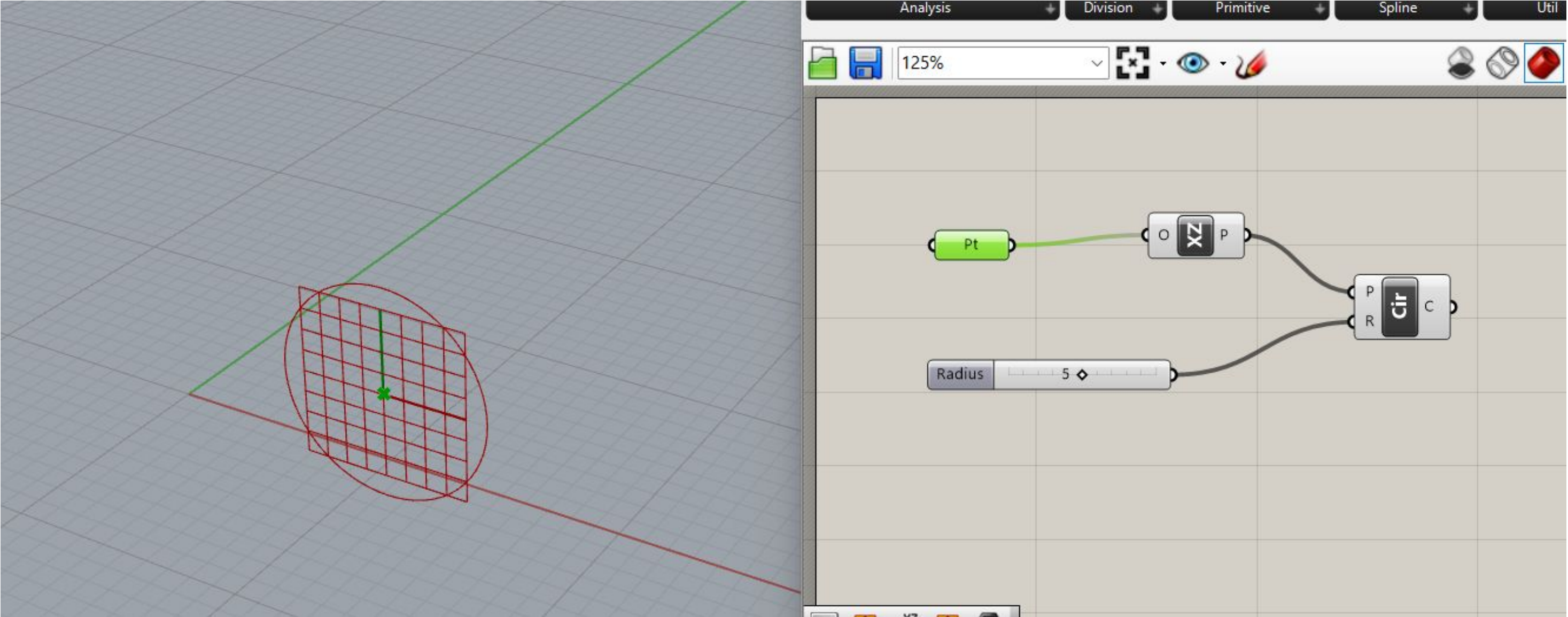
The interface shows a series of interconnected nodes and sliders. The top section, highlighted in purple, contains a 'Pt' node connected to a 'Cir' node. A 'Radius' slider with a value of 5 is connected to the 'Cir' node. The 'Cir' node is also connected to a 'Pipe' node. A second 'Radius' slider with a value of 2 is connected to the 'Pipe' node. The bottom section contains a 'Pt' node connected to an 'XZ' node, which is then connected to a 'P' node. A 'Cir' node is also connected to the 'P' node. A 'Radius' slider with a value of 5 is connected to the 'Cir' node. The interface includes a toolbar at the top with various icons for different tools and a status bar at the bottom indicating 'Autosave complete (60 seconds ago)'.

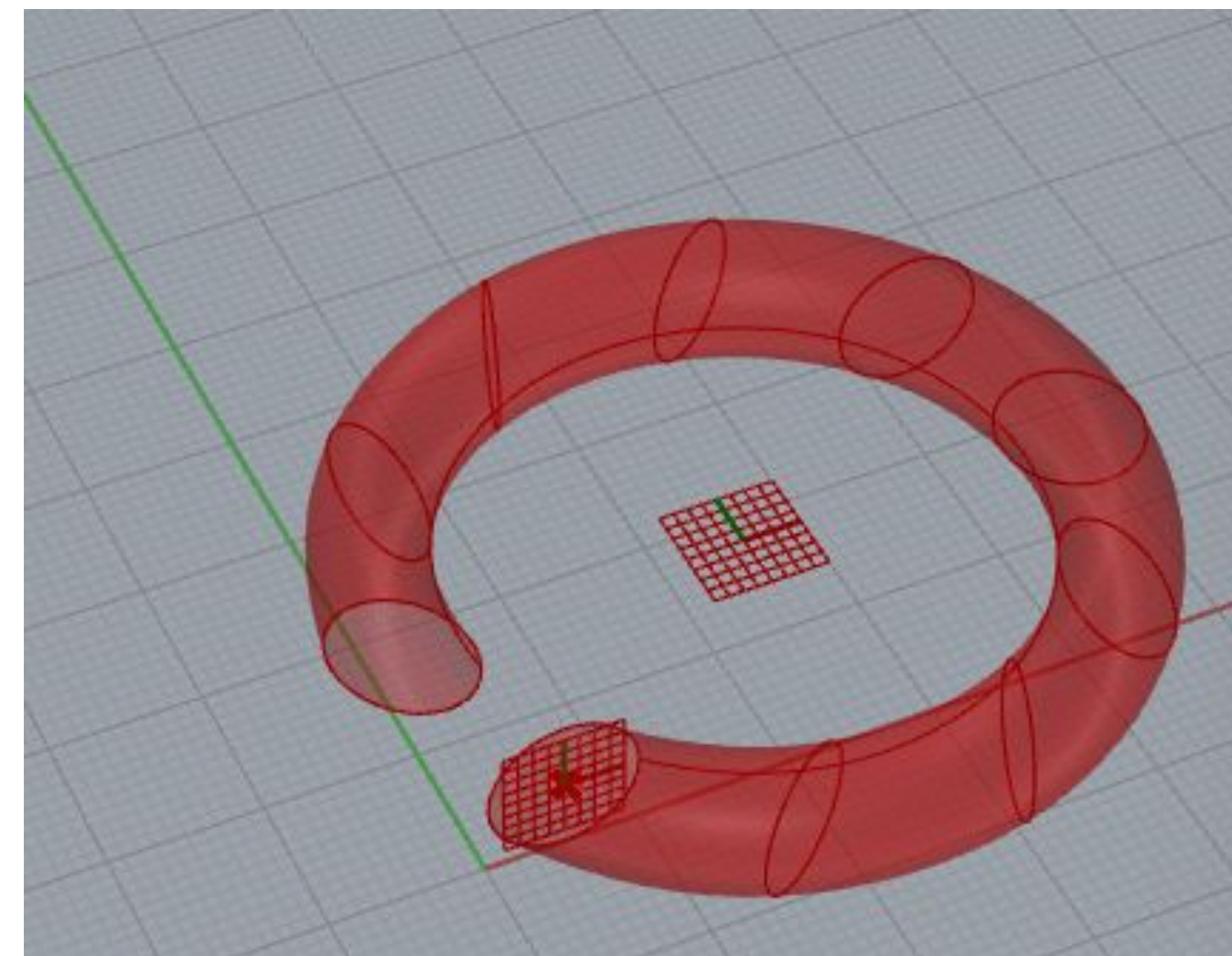
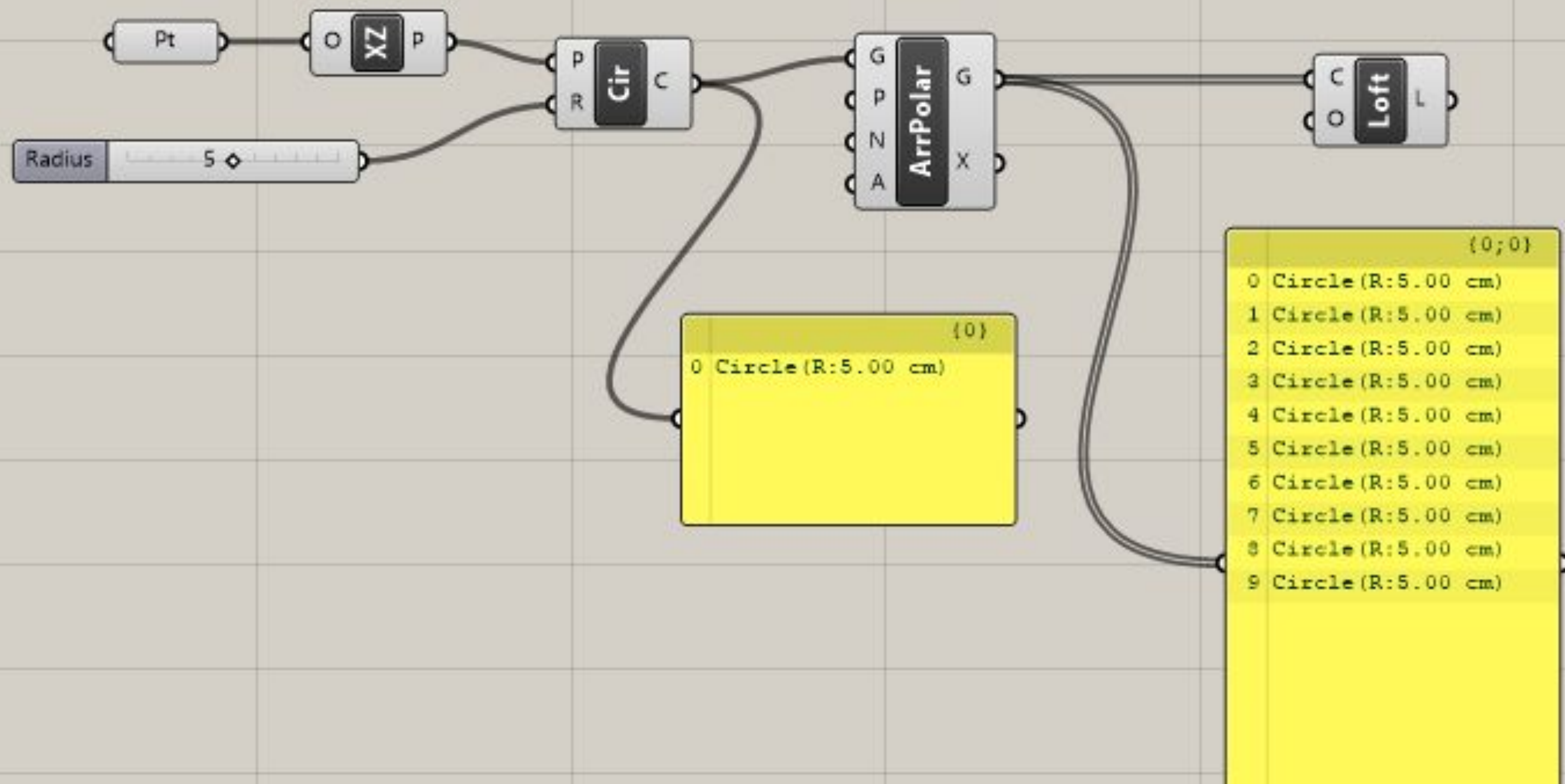




torus 2

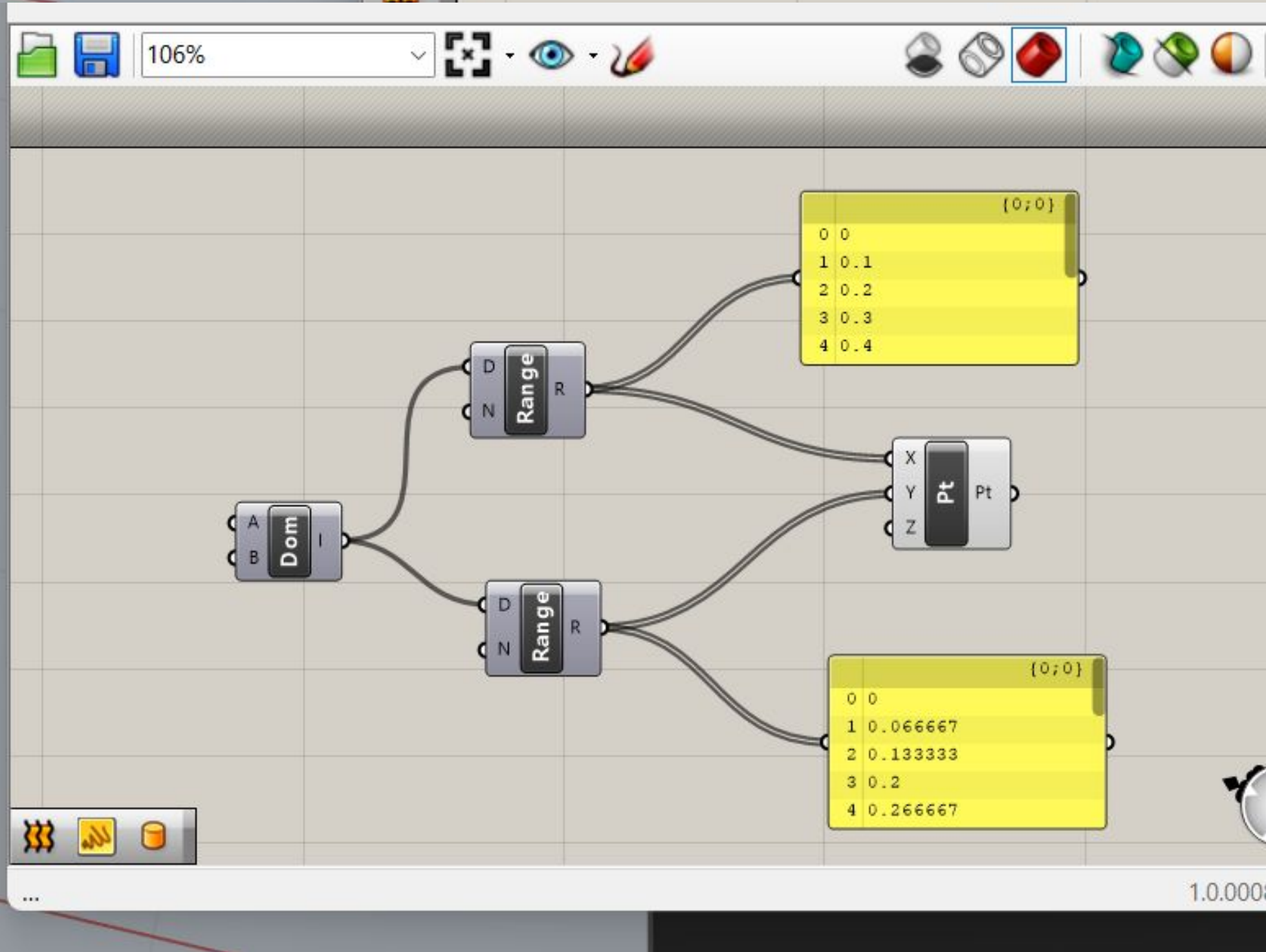
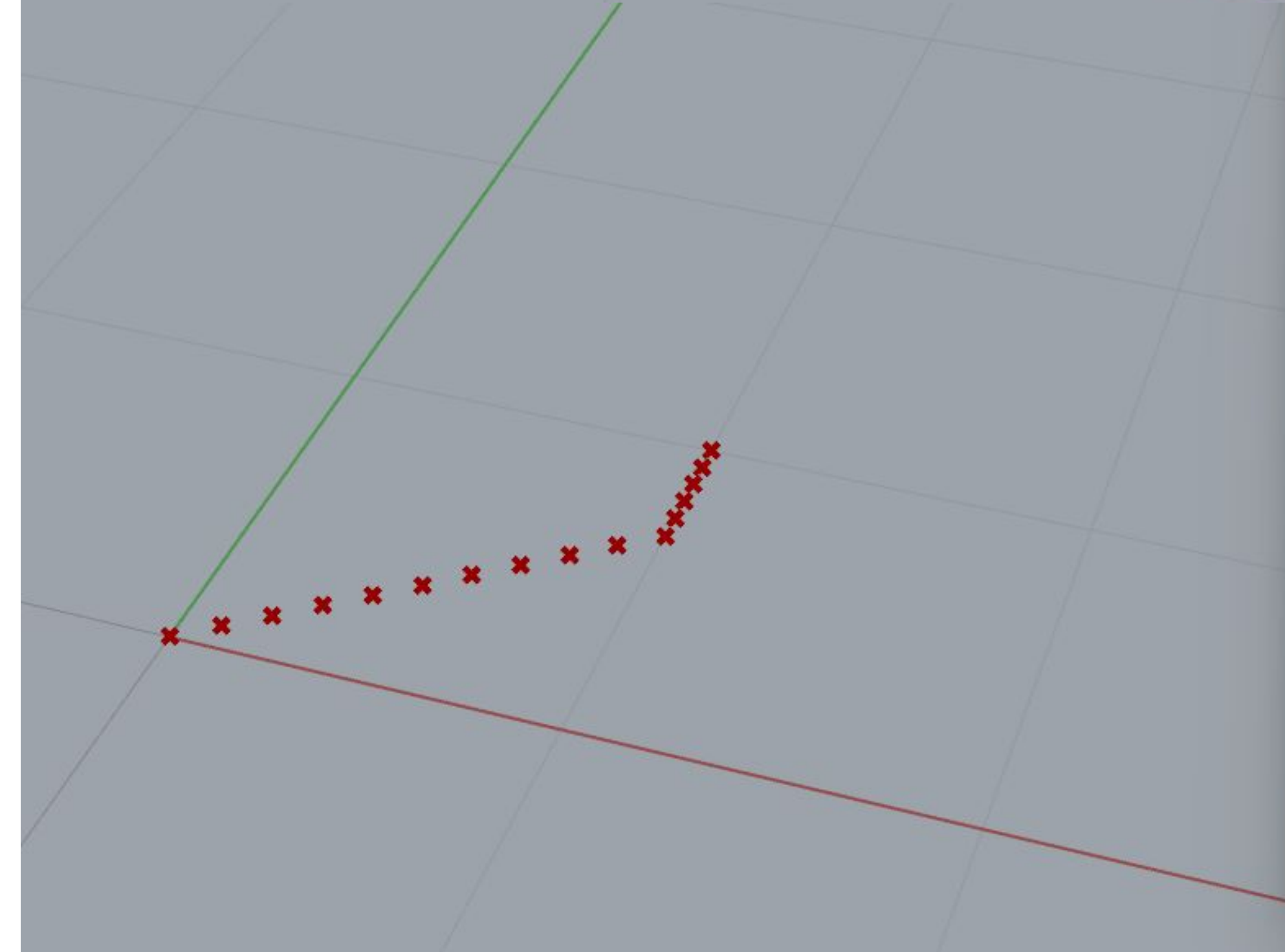
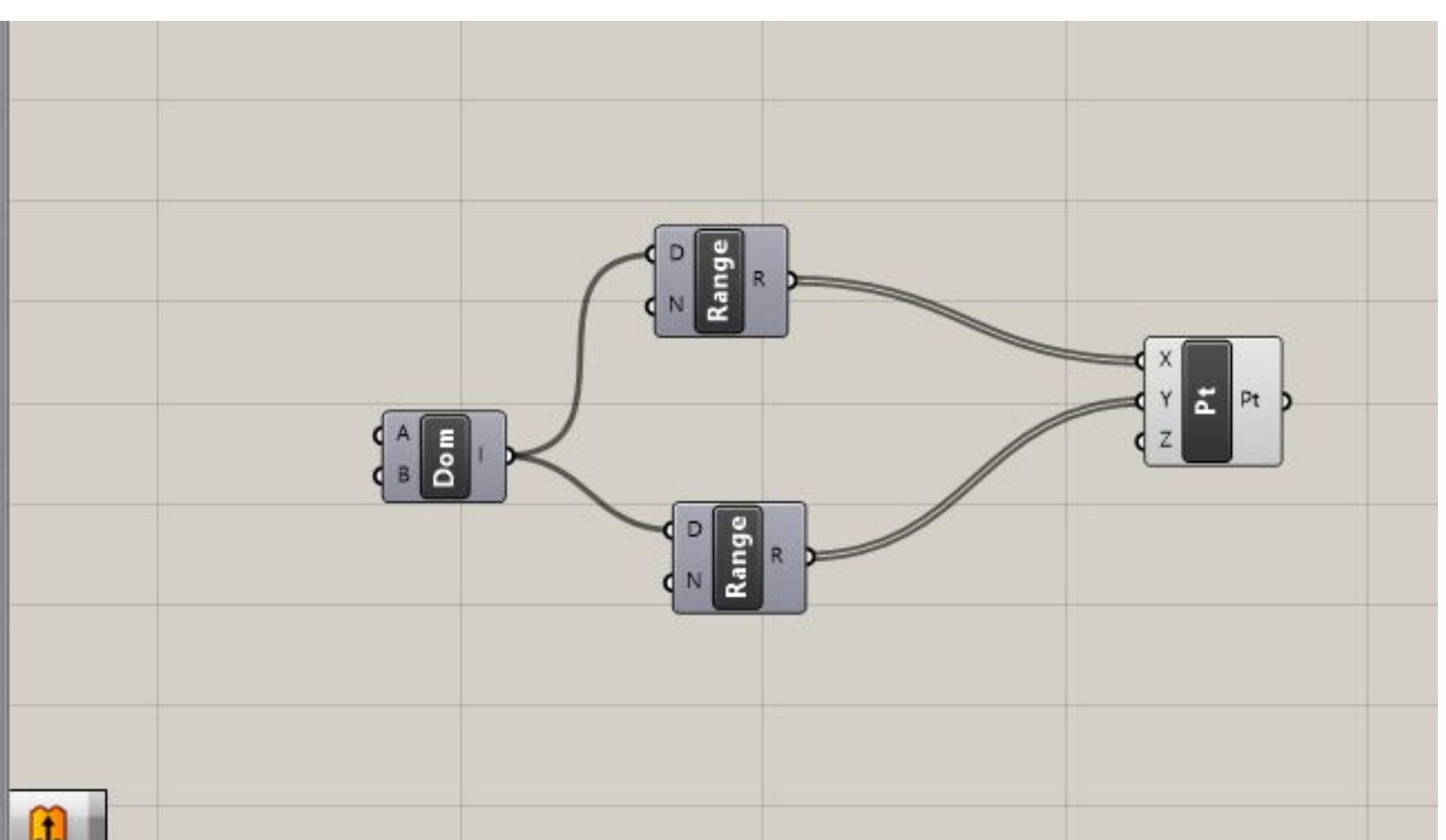
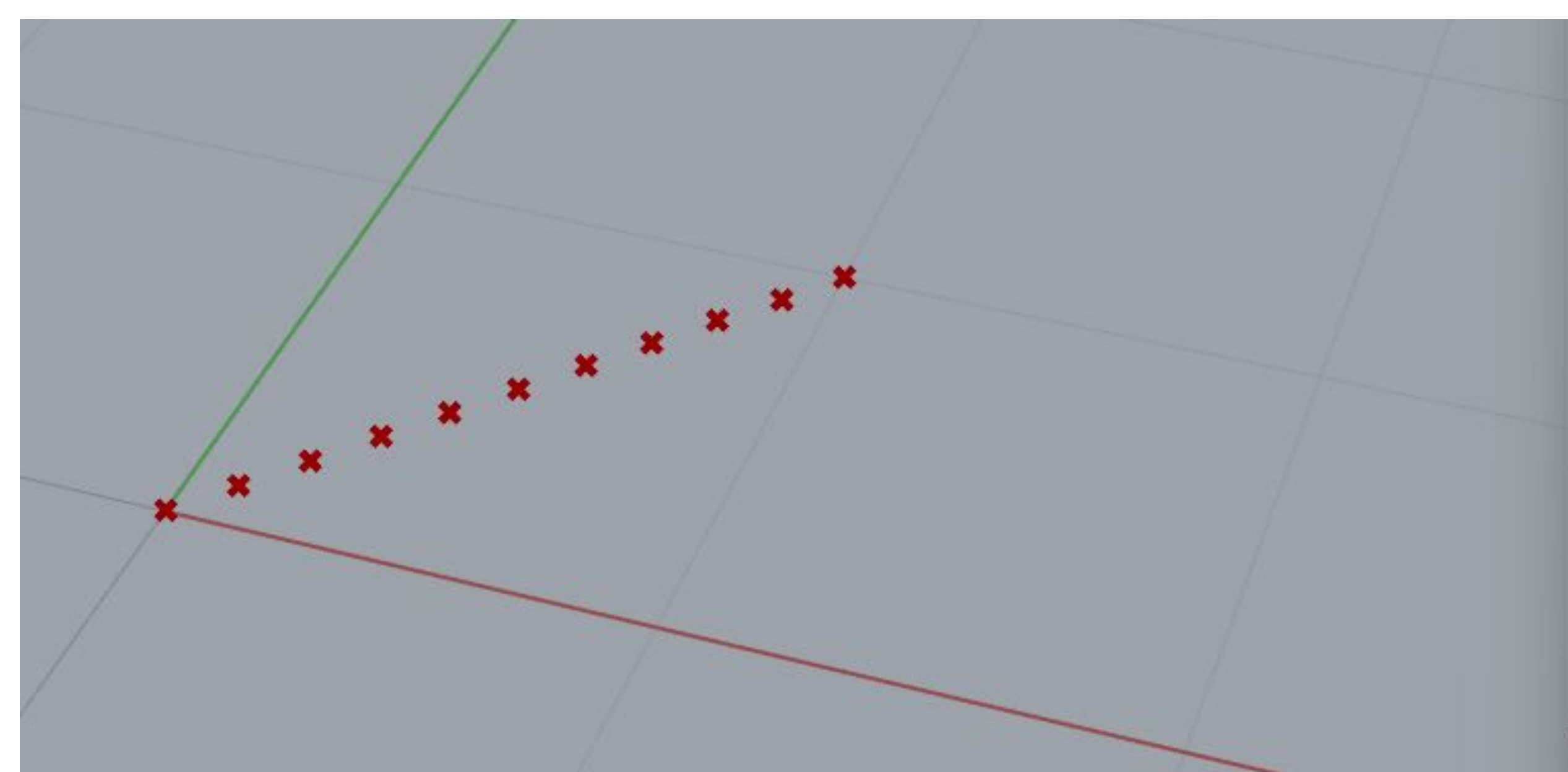
- point, "set one point"
- plane XZ
- CIRC
- carregar 2x, 5 (radius)
- na perspectiva, fazer uma linha vertical que une o centro do circulo com o seu raio
- fazer um point na perspectiva, ao lado
- polararray, ligar o c ao g, botão dir, no "P", "set one plane" e selecionar o point que fizemos ao lado
- loft, carregar em cima do "O" botão dir., "loft options", "closed loft"

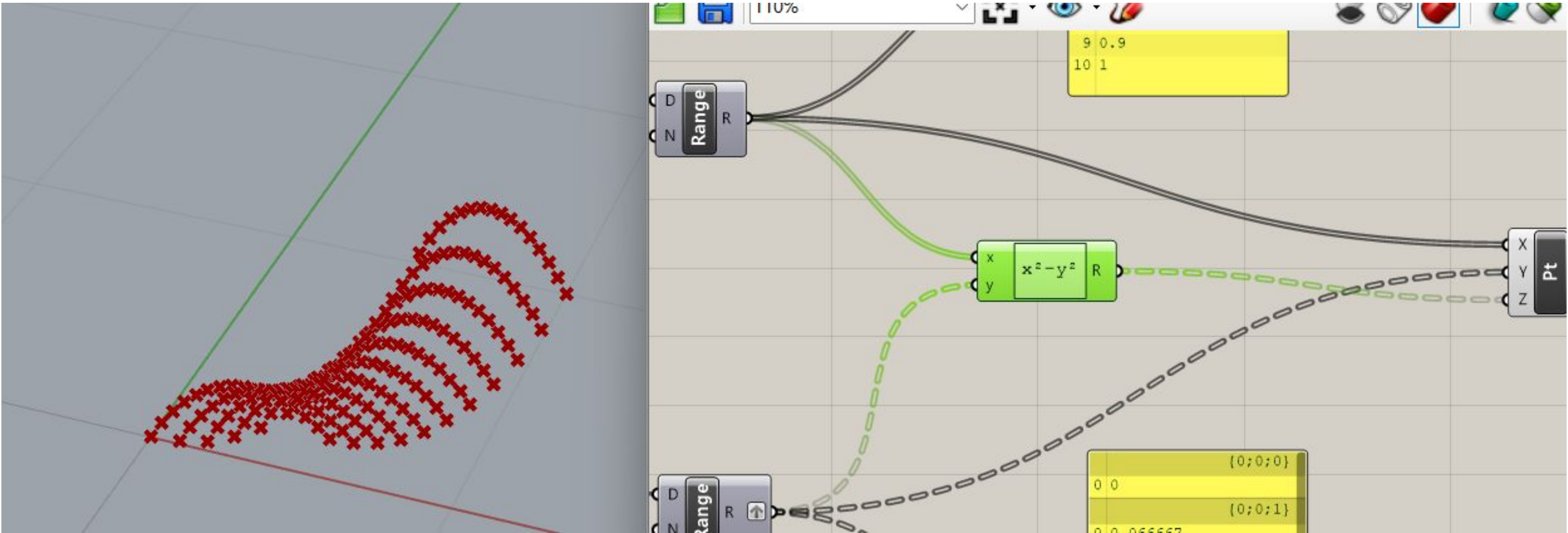
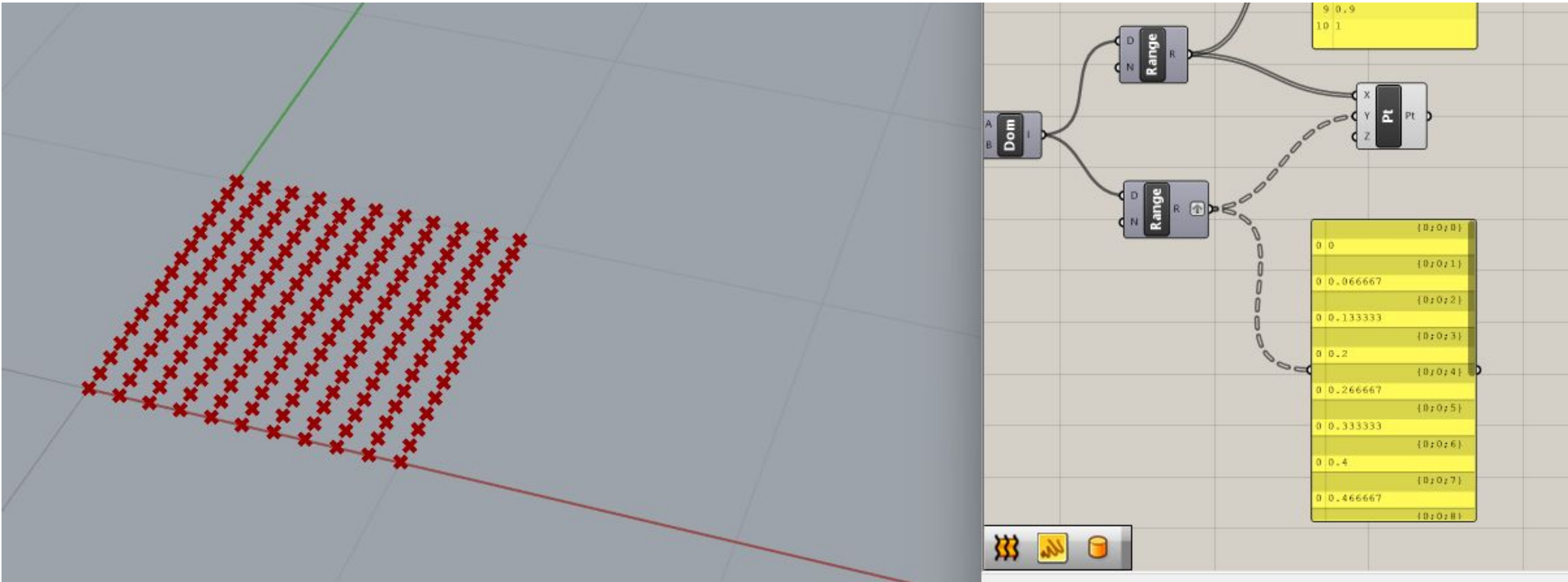


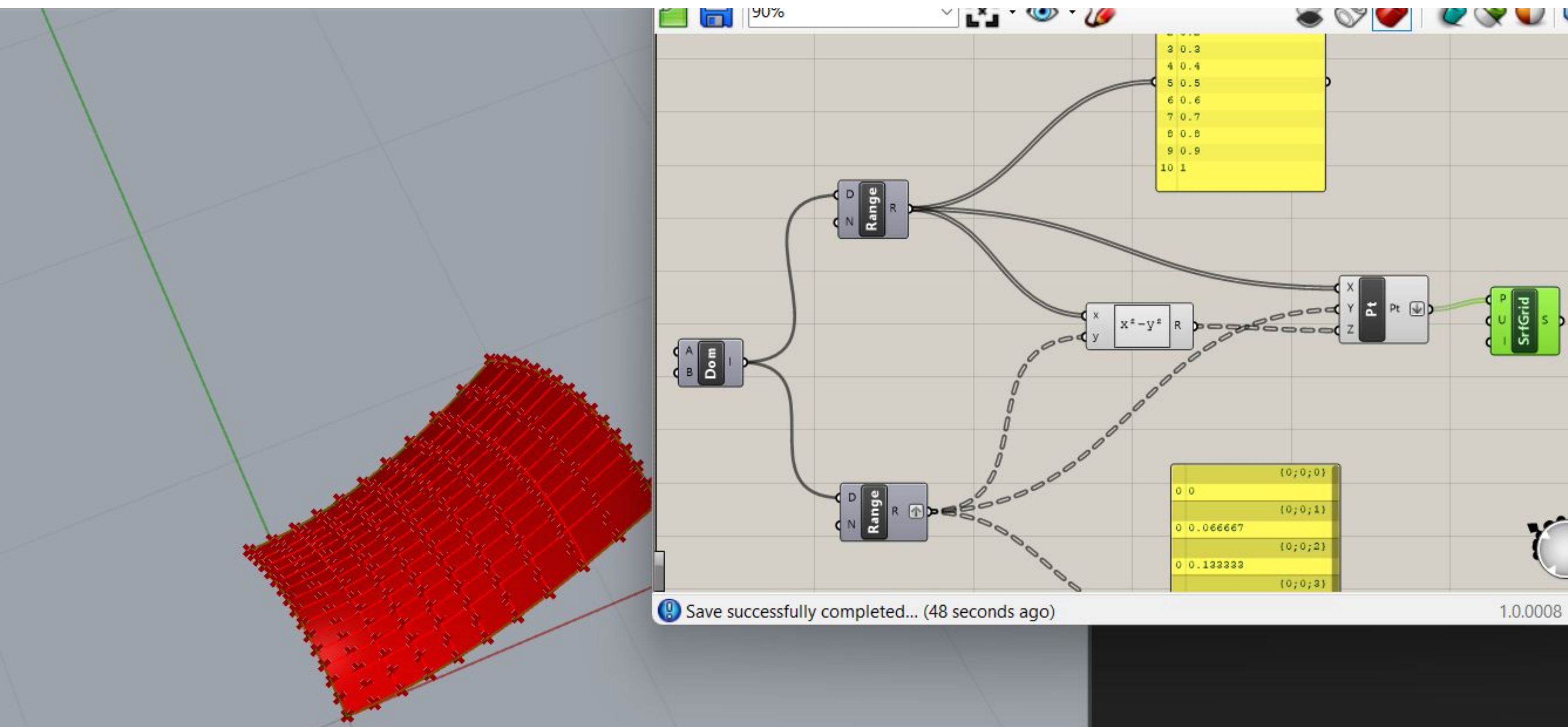


- curve, primitive, circle
- 5 de raio
- carregar 2x, point, botão dir, "set one point", selecionar im ponto qualquer na perspectiva
- plano xz
- arraypolar, botão dir no "P" "set one plane"
- fazer um painel ligado com circle e outro ligado ao "G" do arraypolar

GRELHA DE PONTOS - GRASSHOPPER



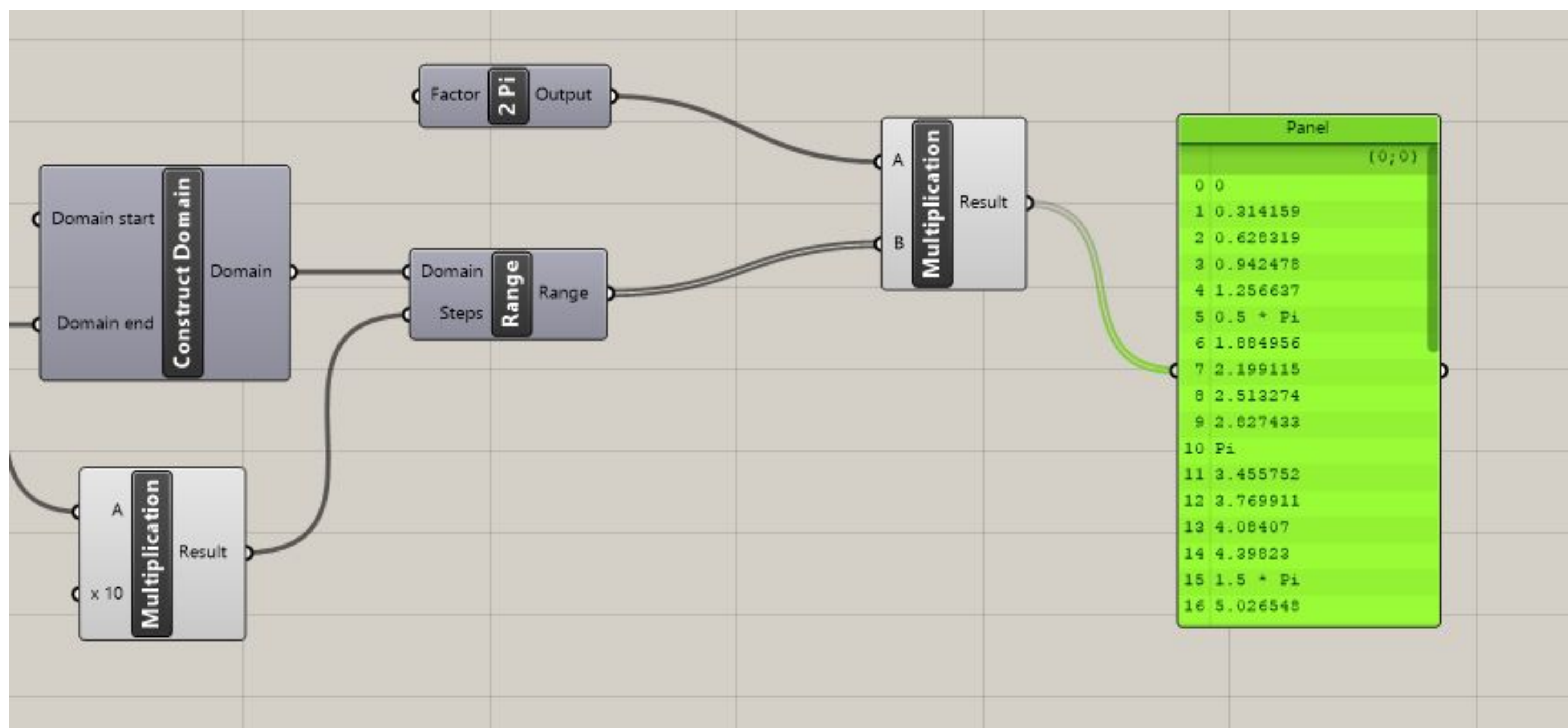
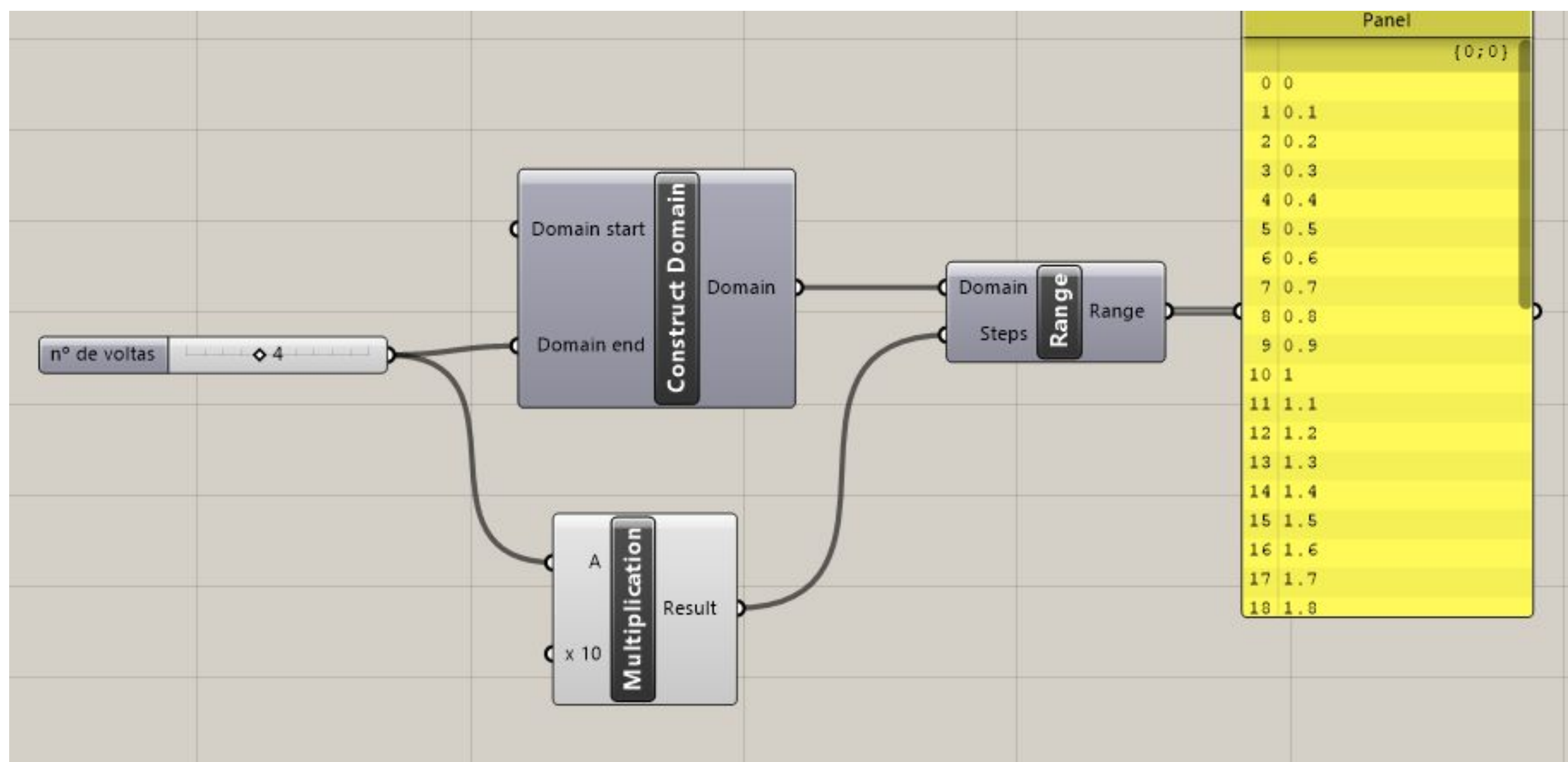


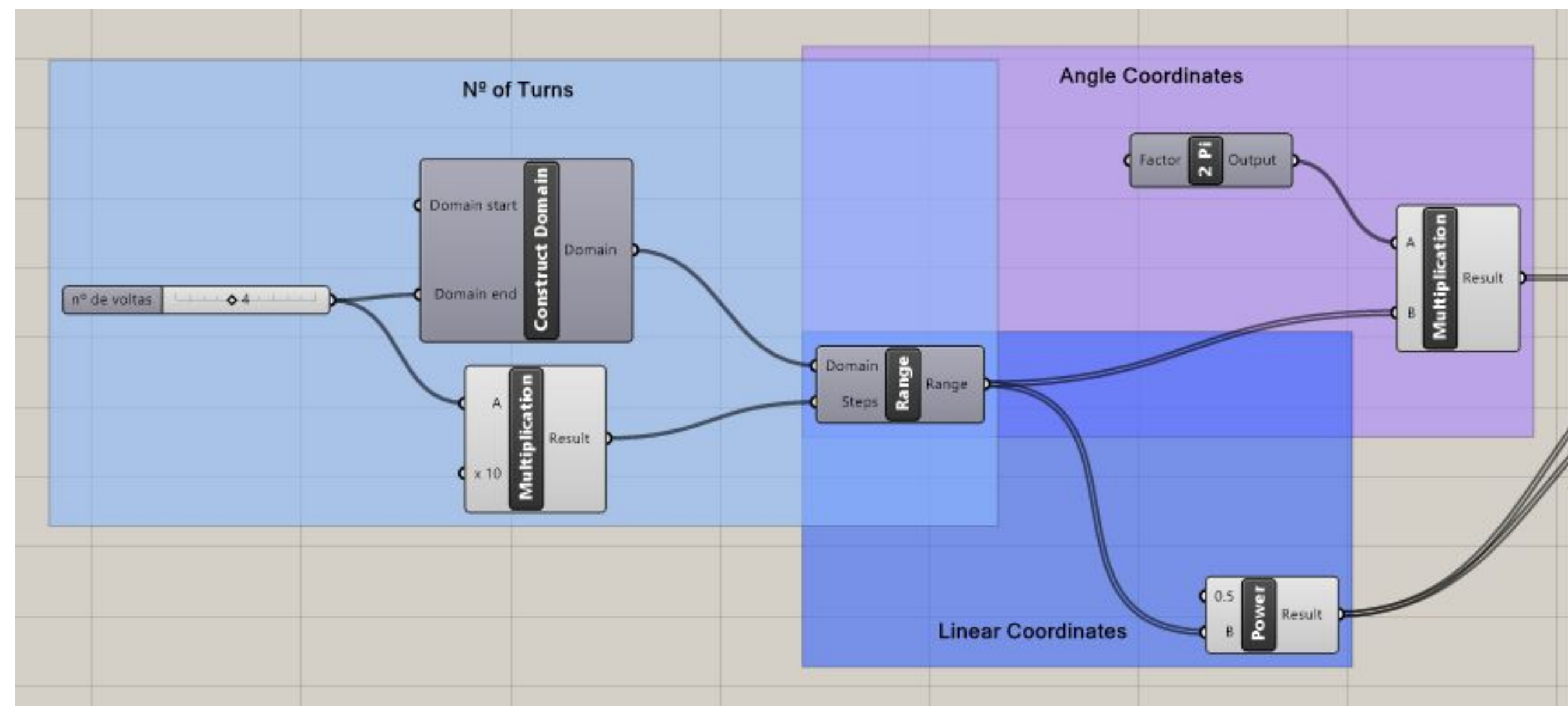
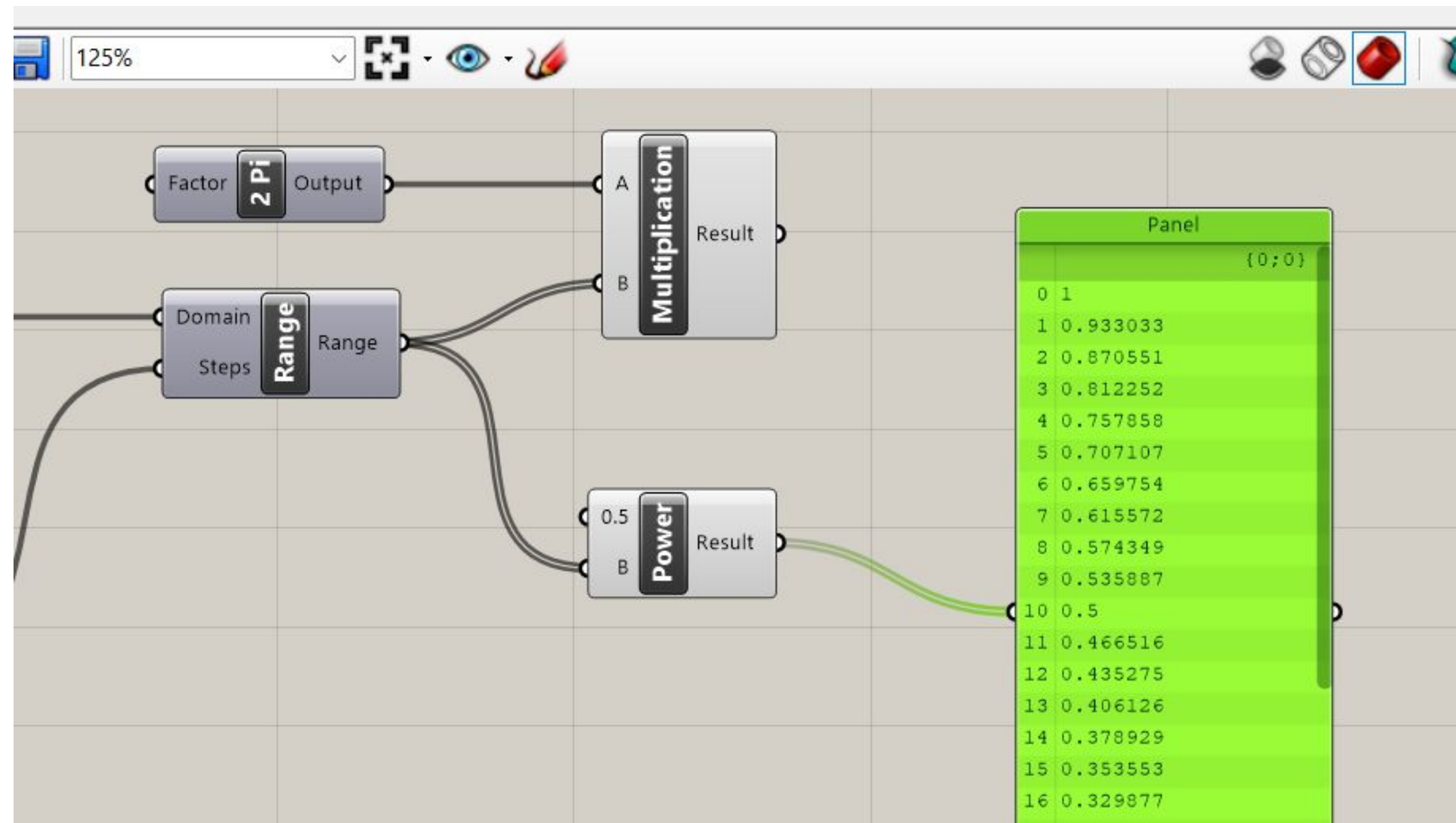


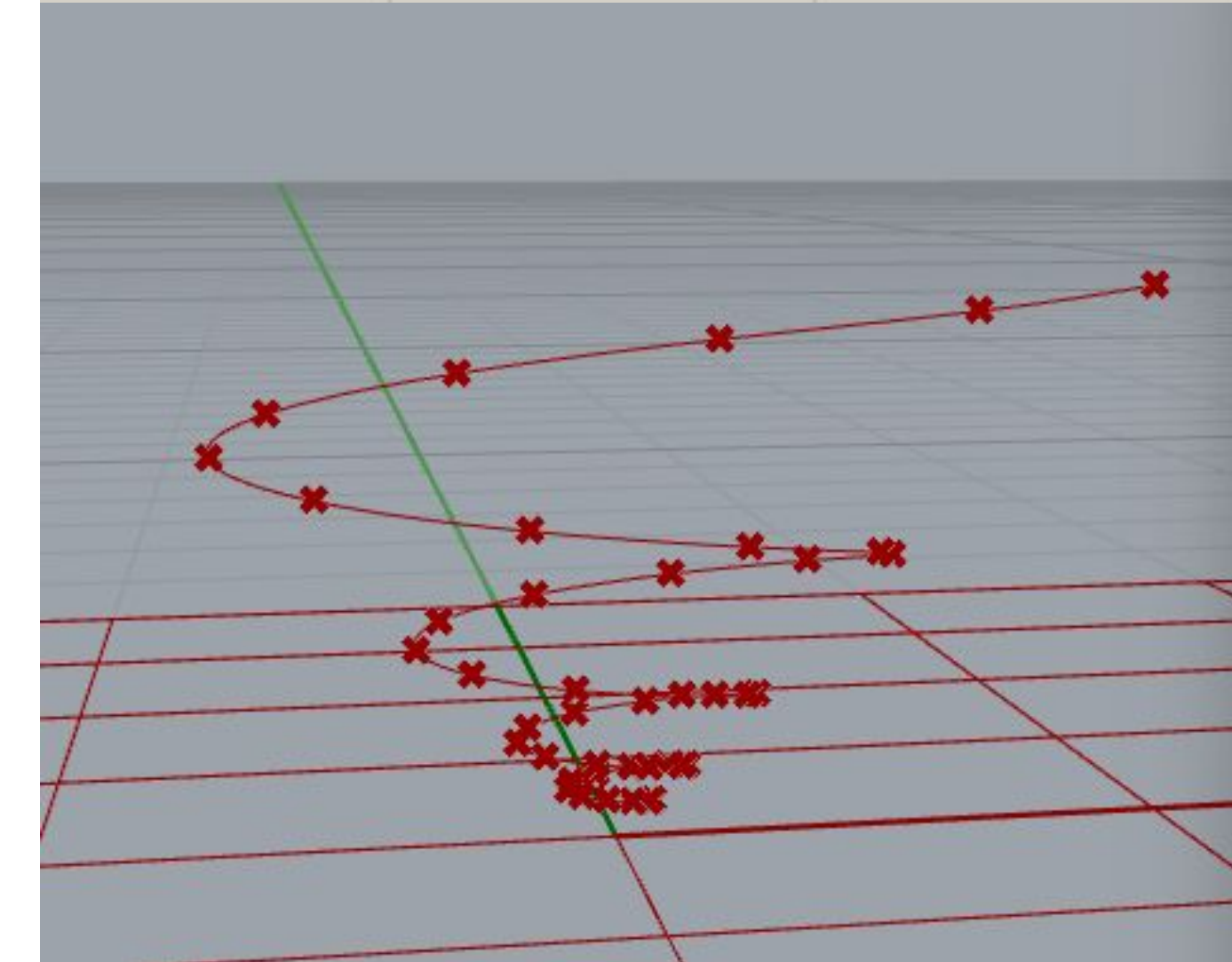
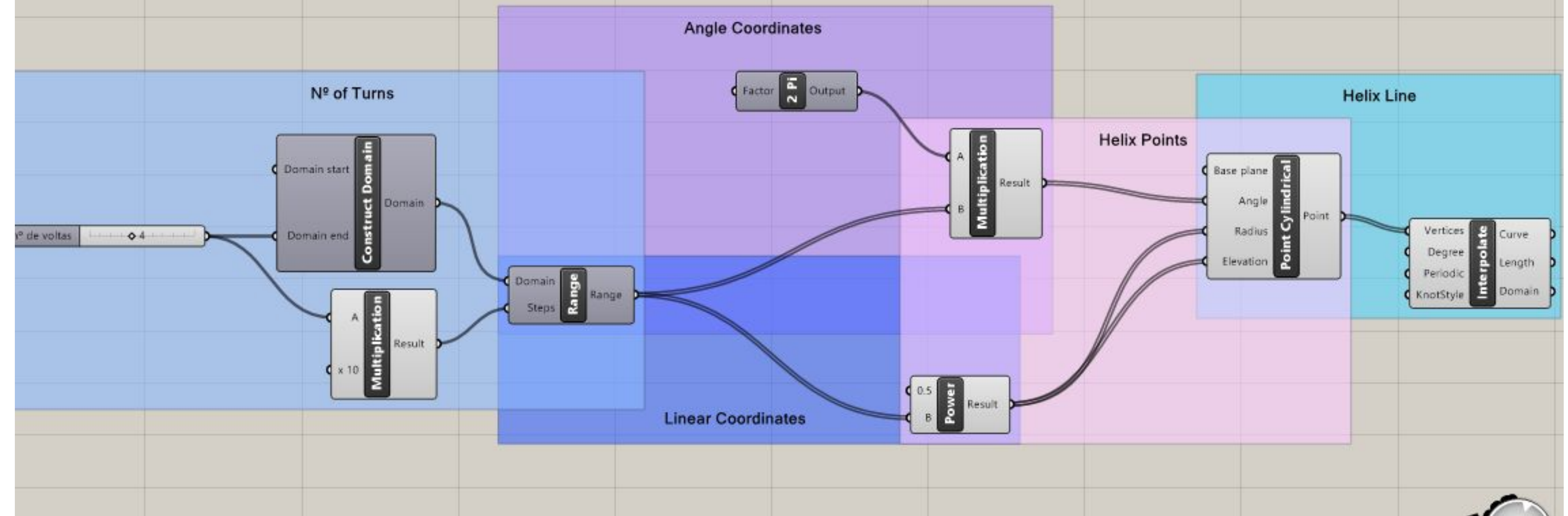
GRELHA DE PONTOS

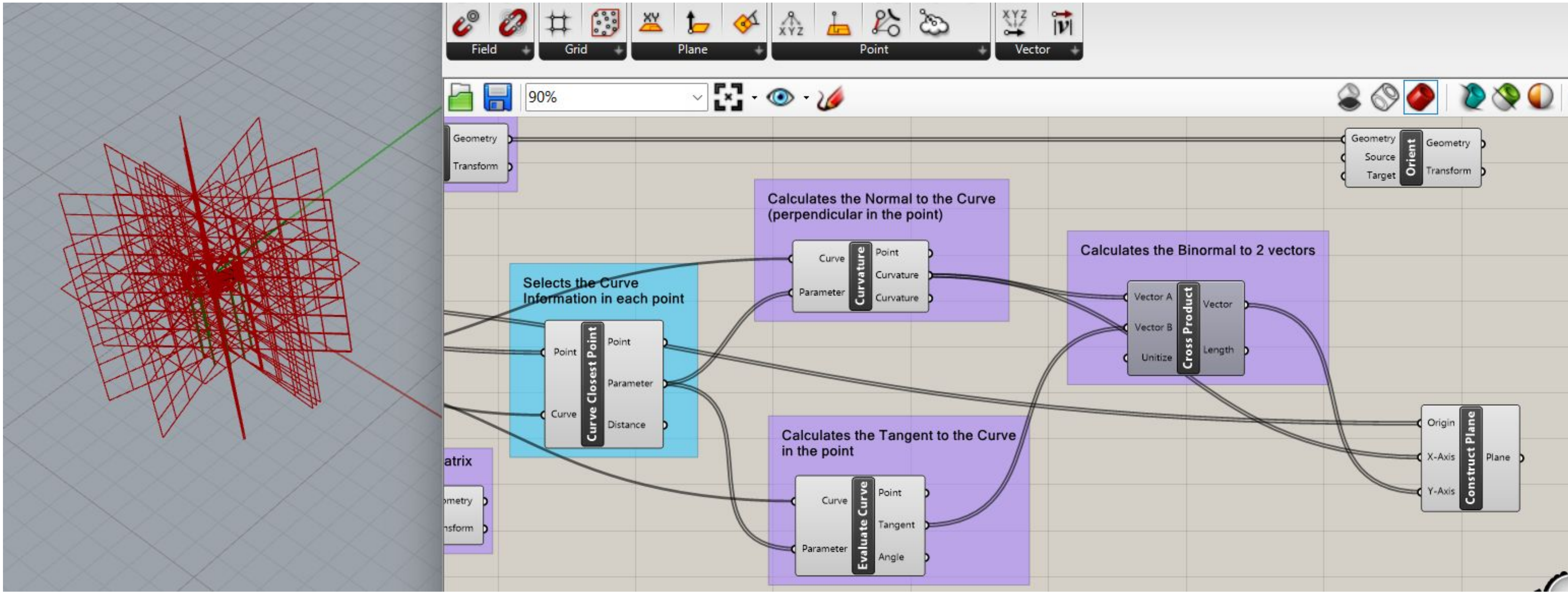
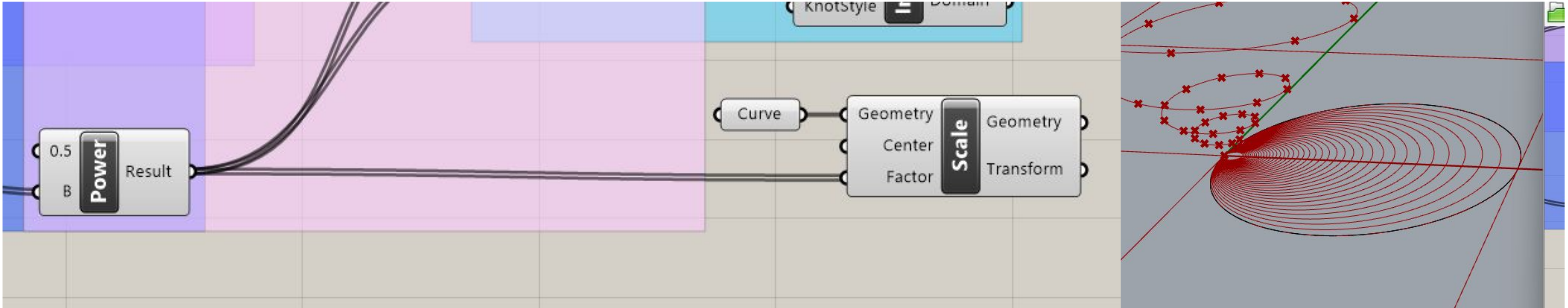
- constructdomain
- range
- range
- construct point
- 2 painéis
- botão dir no "N" do segundo range, "set integer", mudar para 15
- botão dir no "R" do segundo range, "graft"
- math, script, expression.
- surfacefrompoints, ligar no "pt" e no "pt" do "construction point" "flatten"
- perspectiva, goshted
- botão dir. no surfacefrompoint, bake, camada do default

CARAMUJO DO MAR- GRASSHOPPER

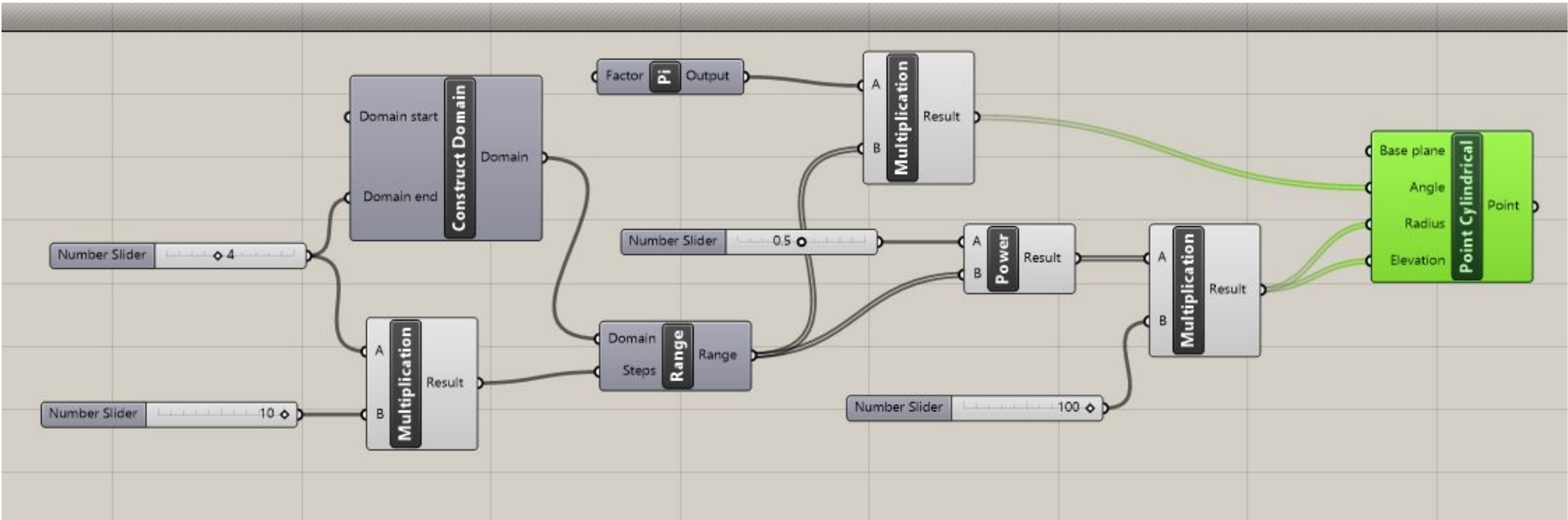
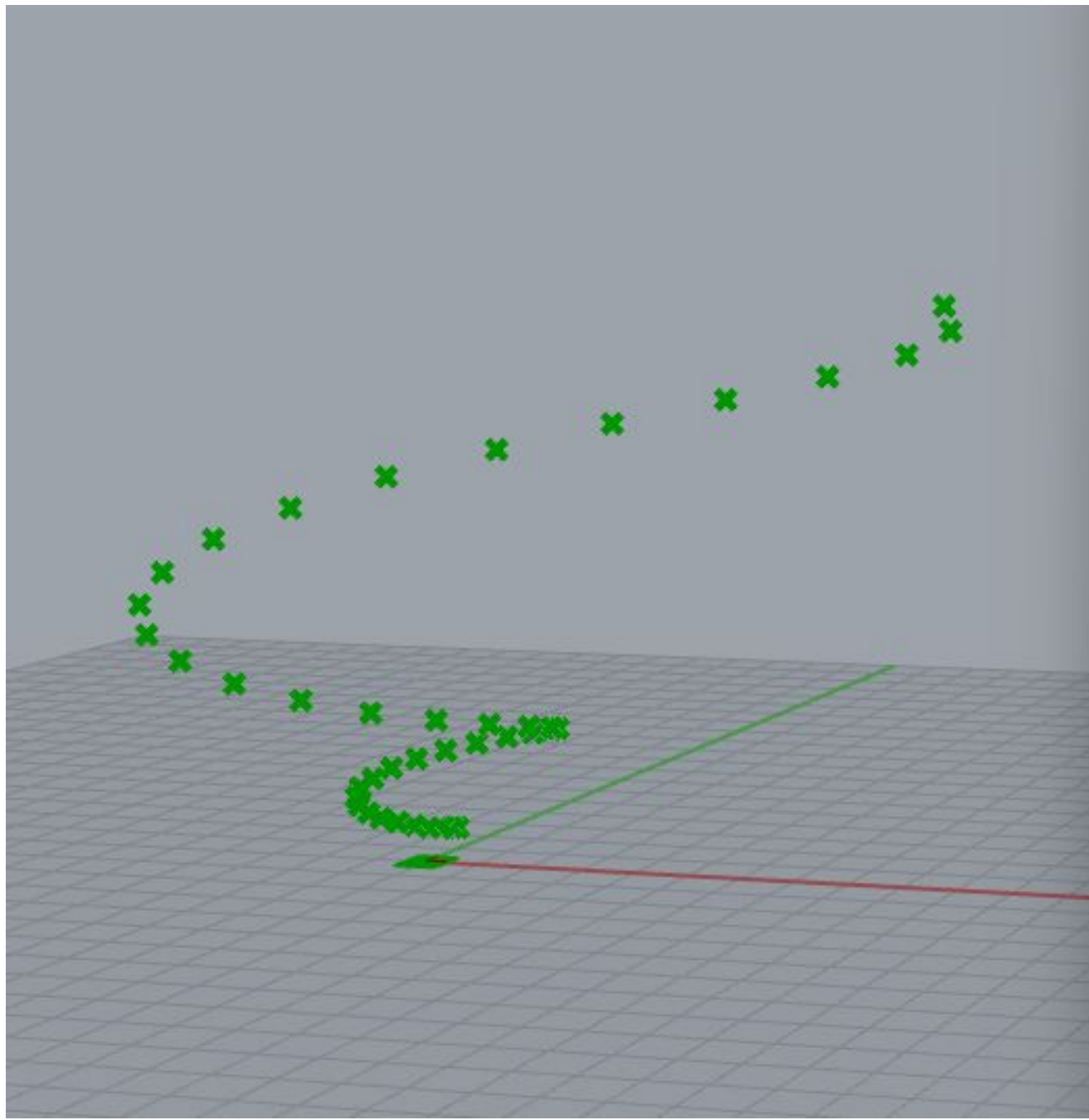
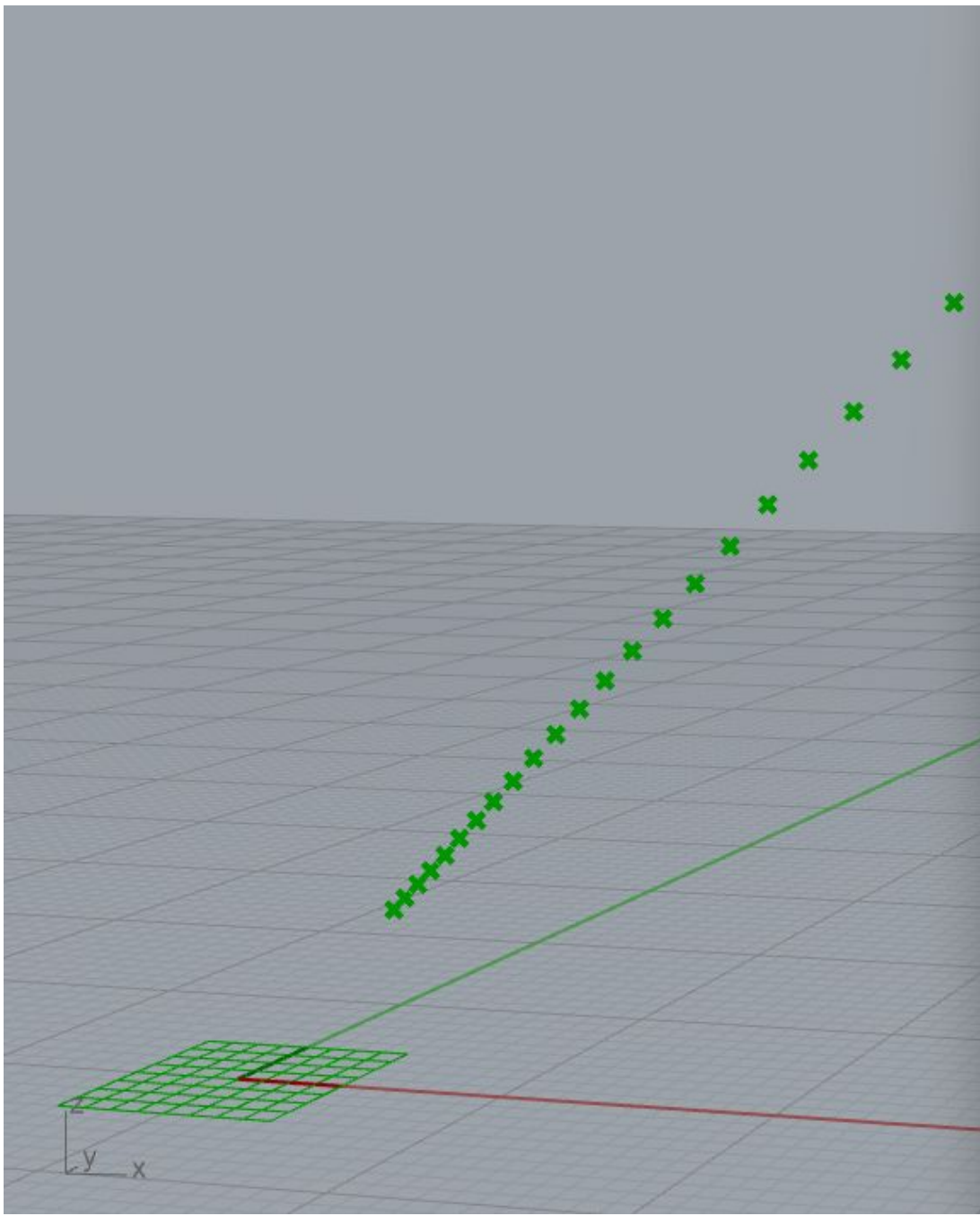


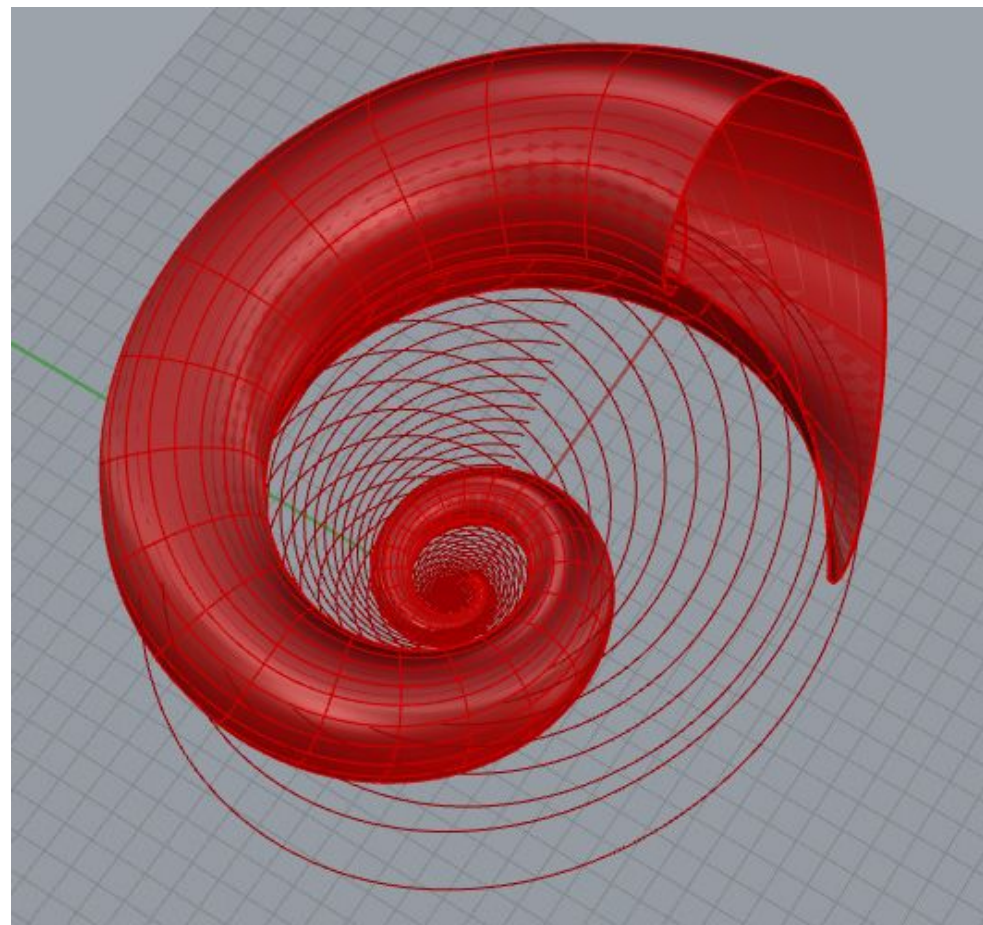
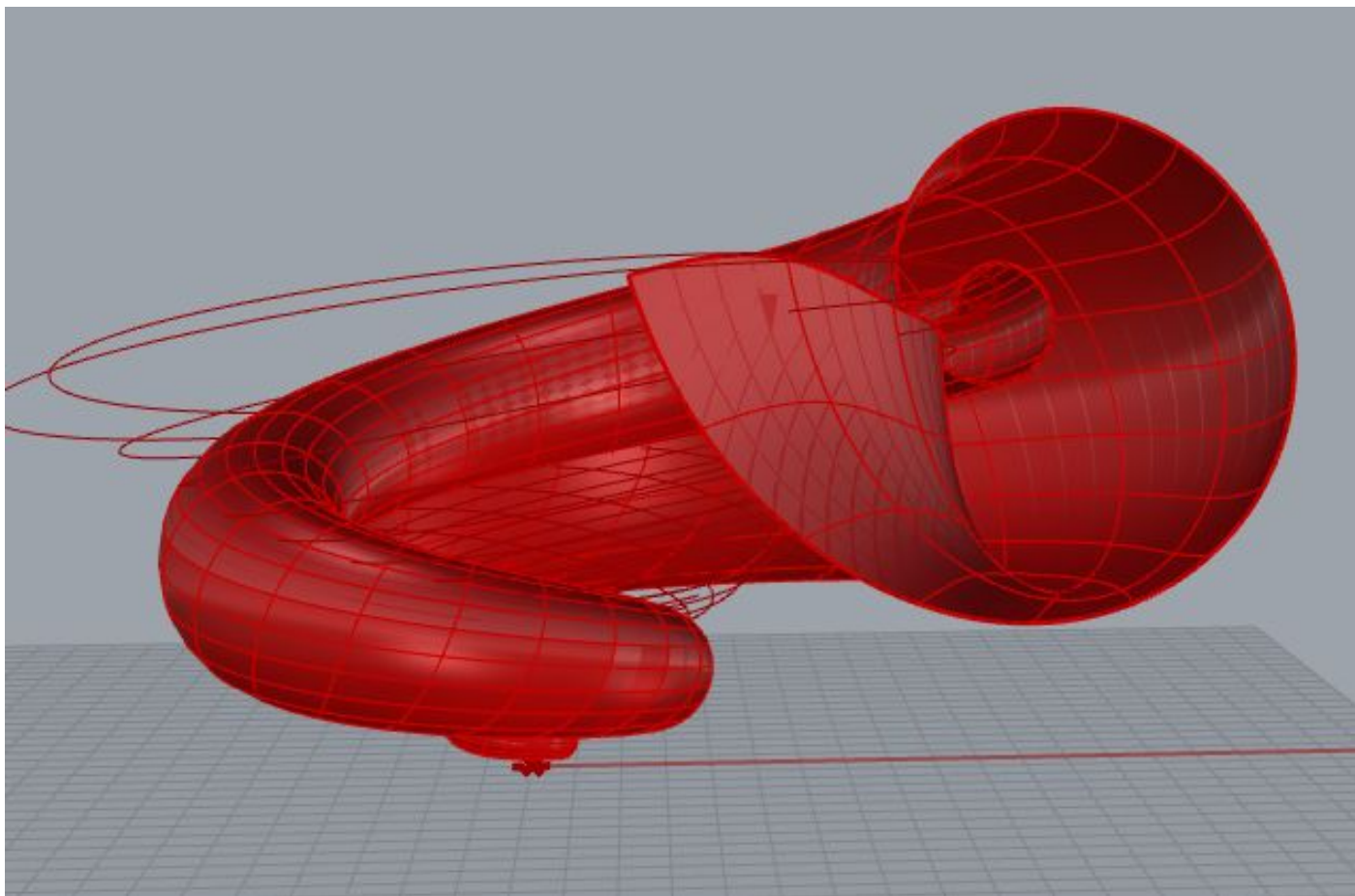
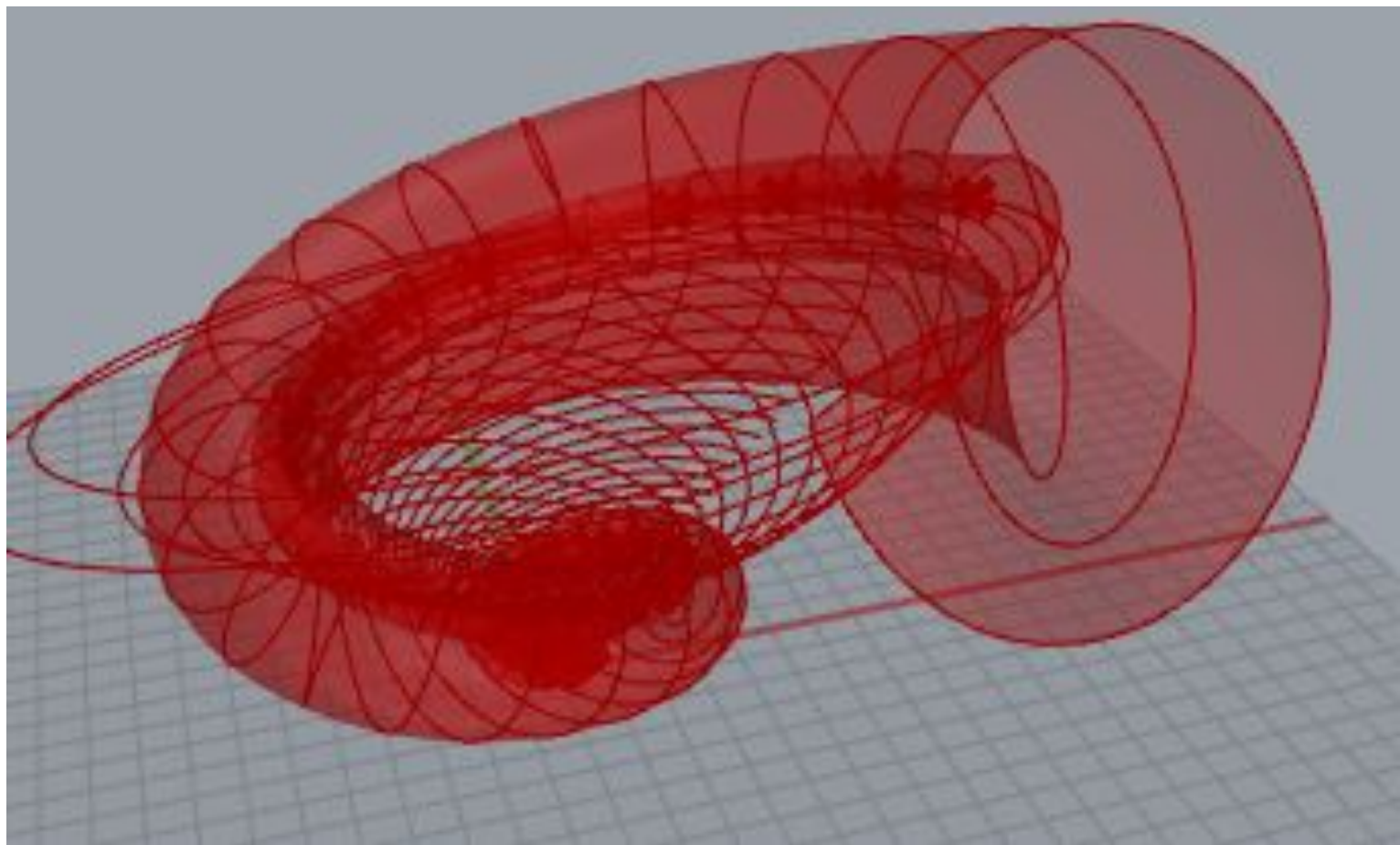
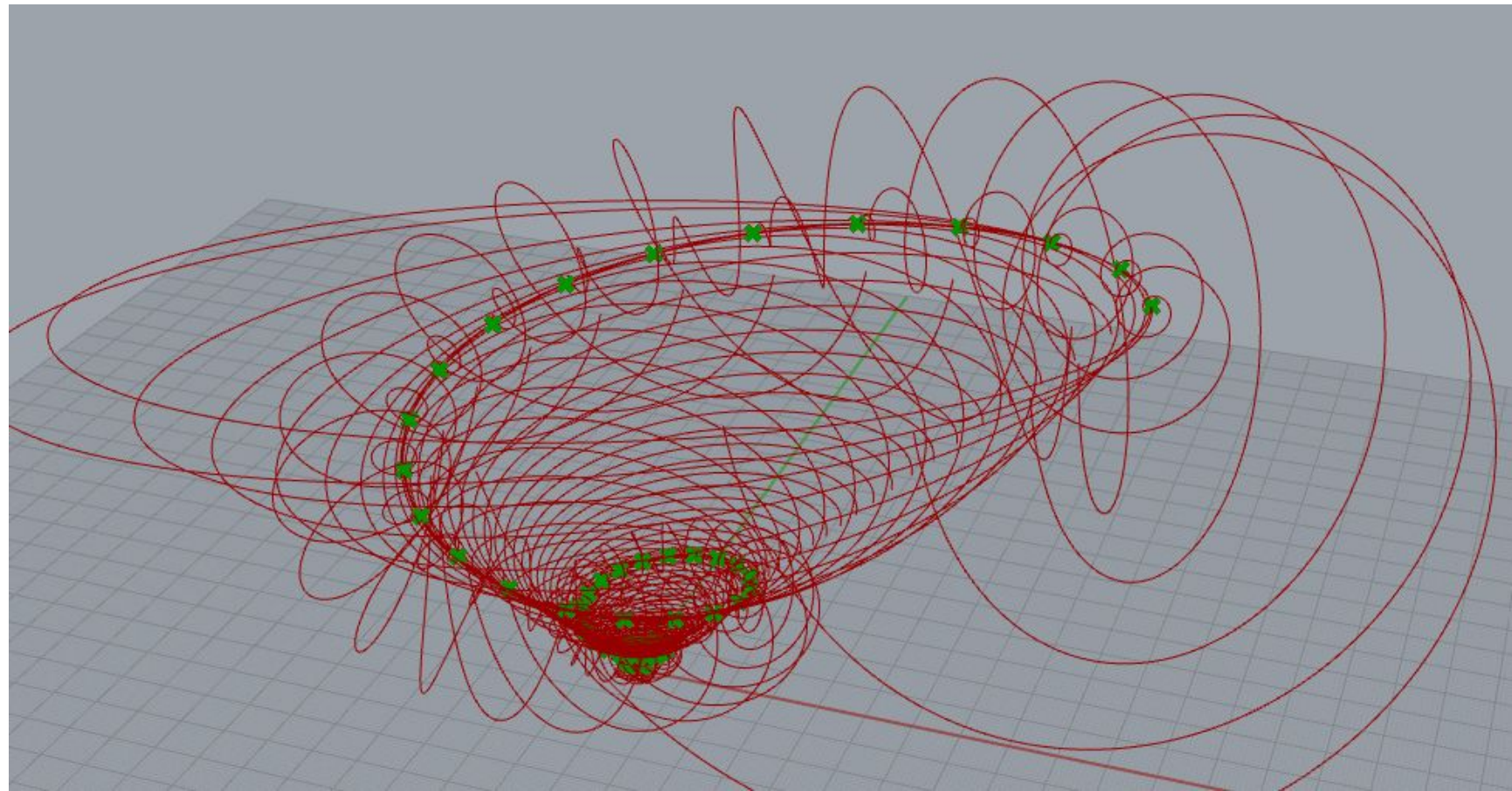
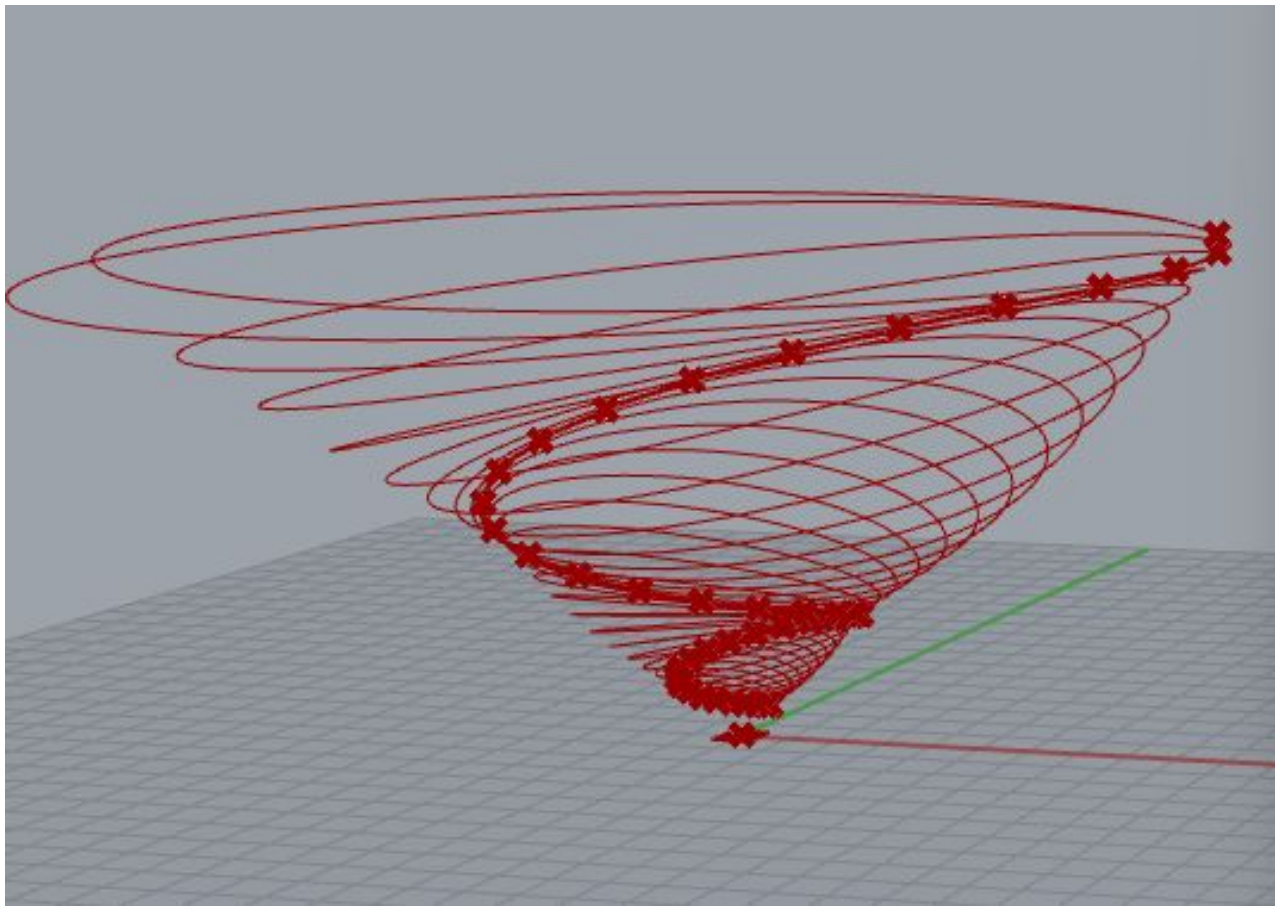
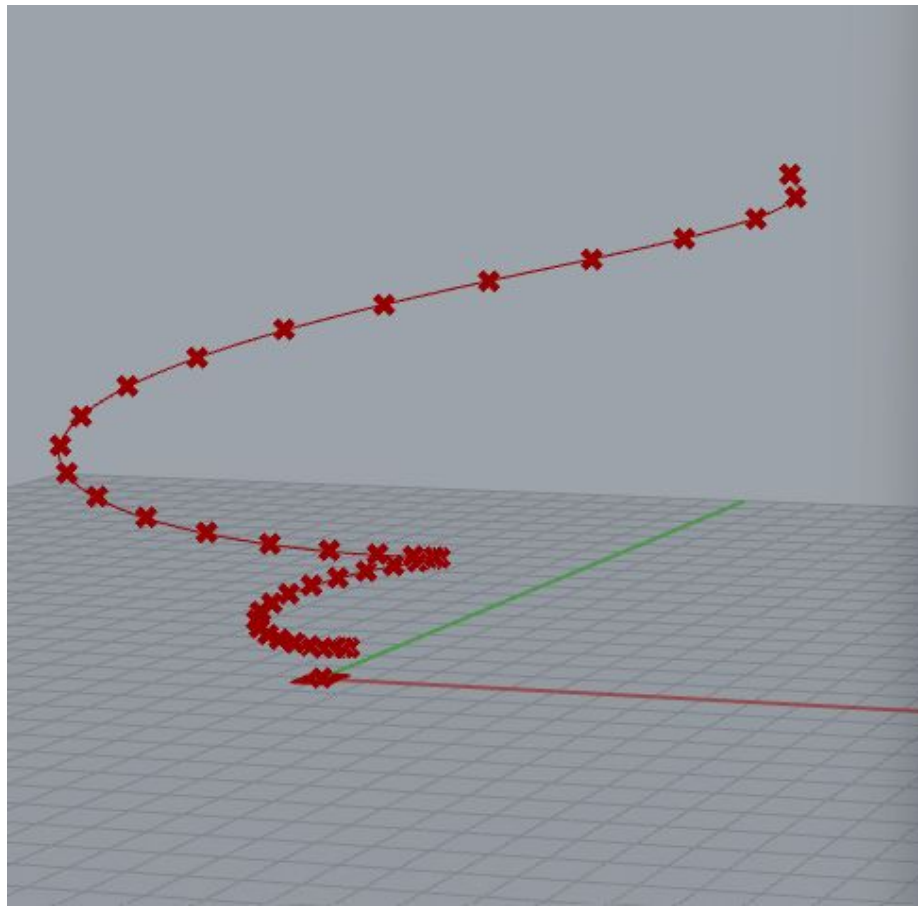


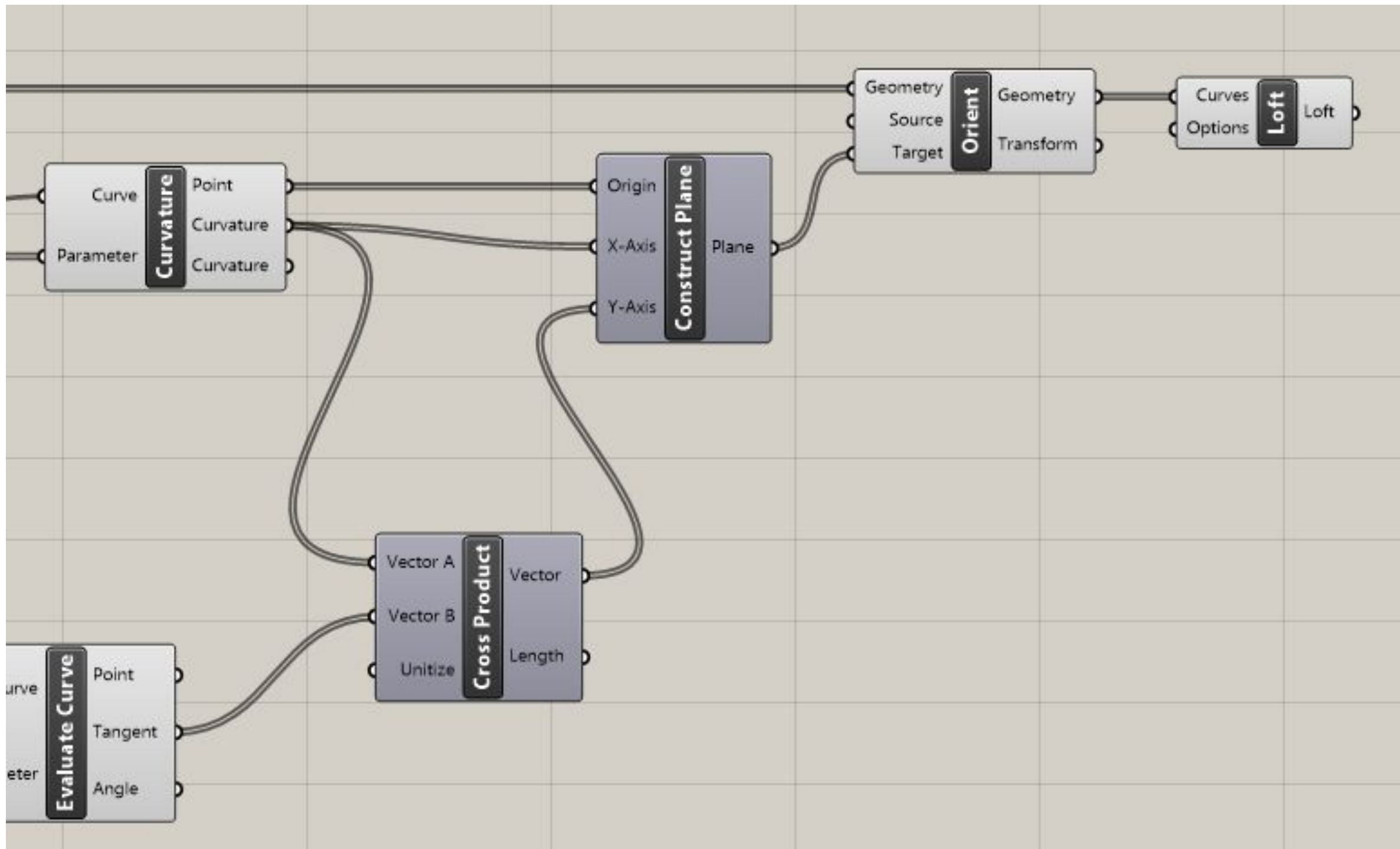
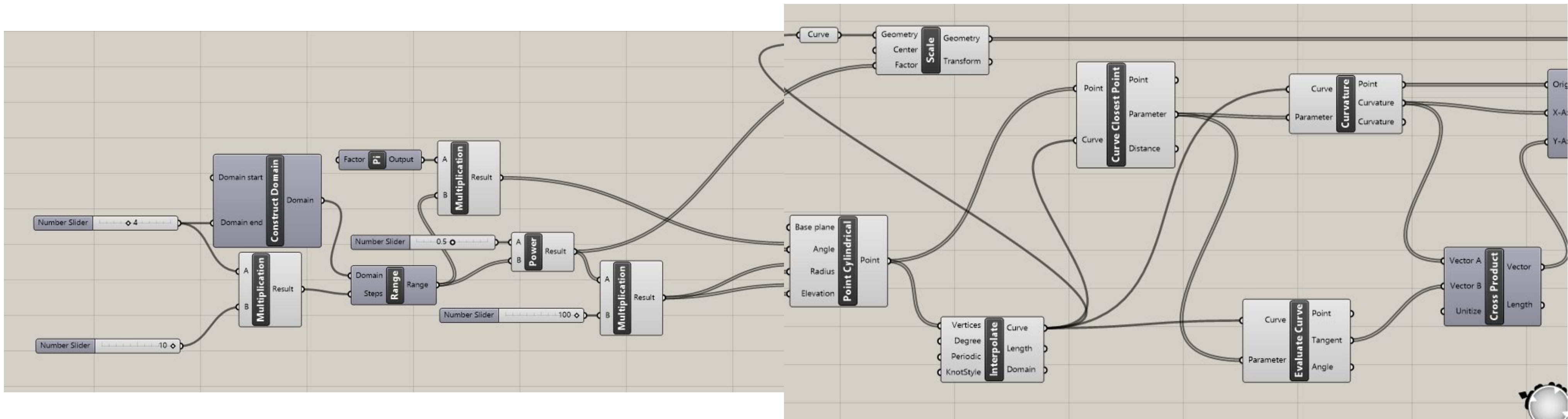




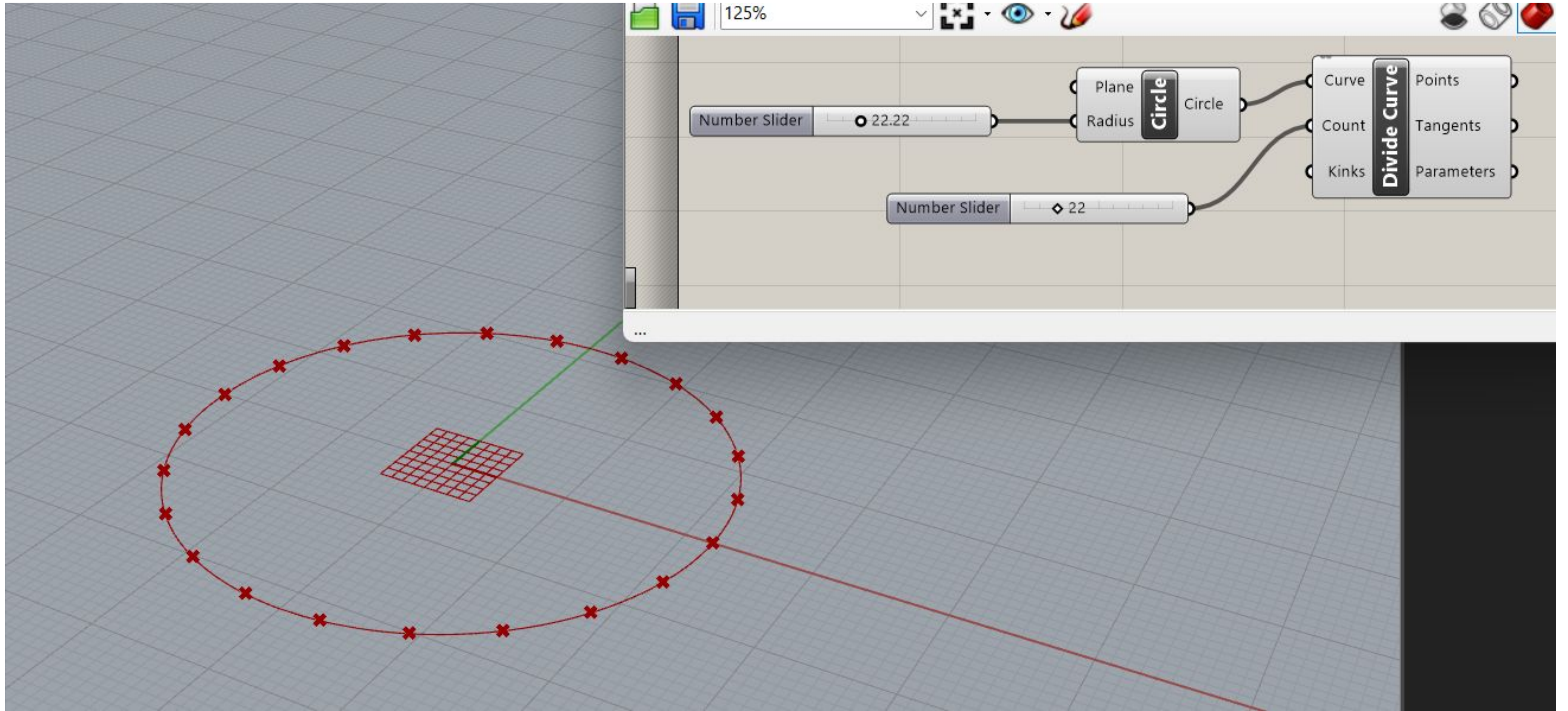
Spirula- GRASSHOPPER - TRABALHO 3

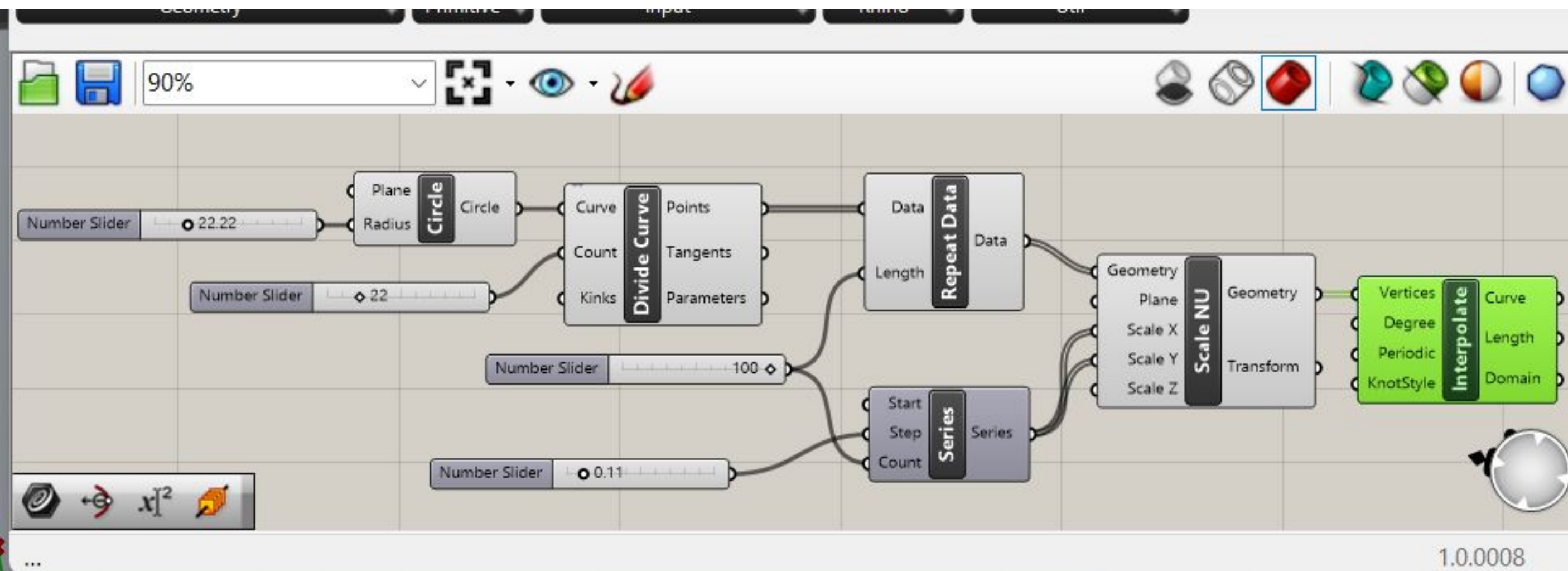
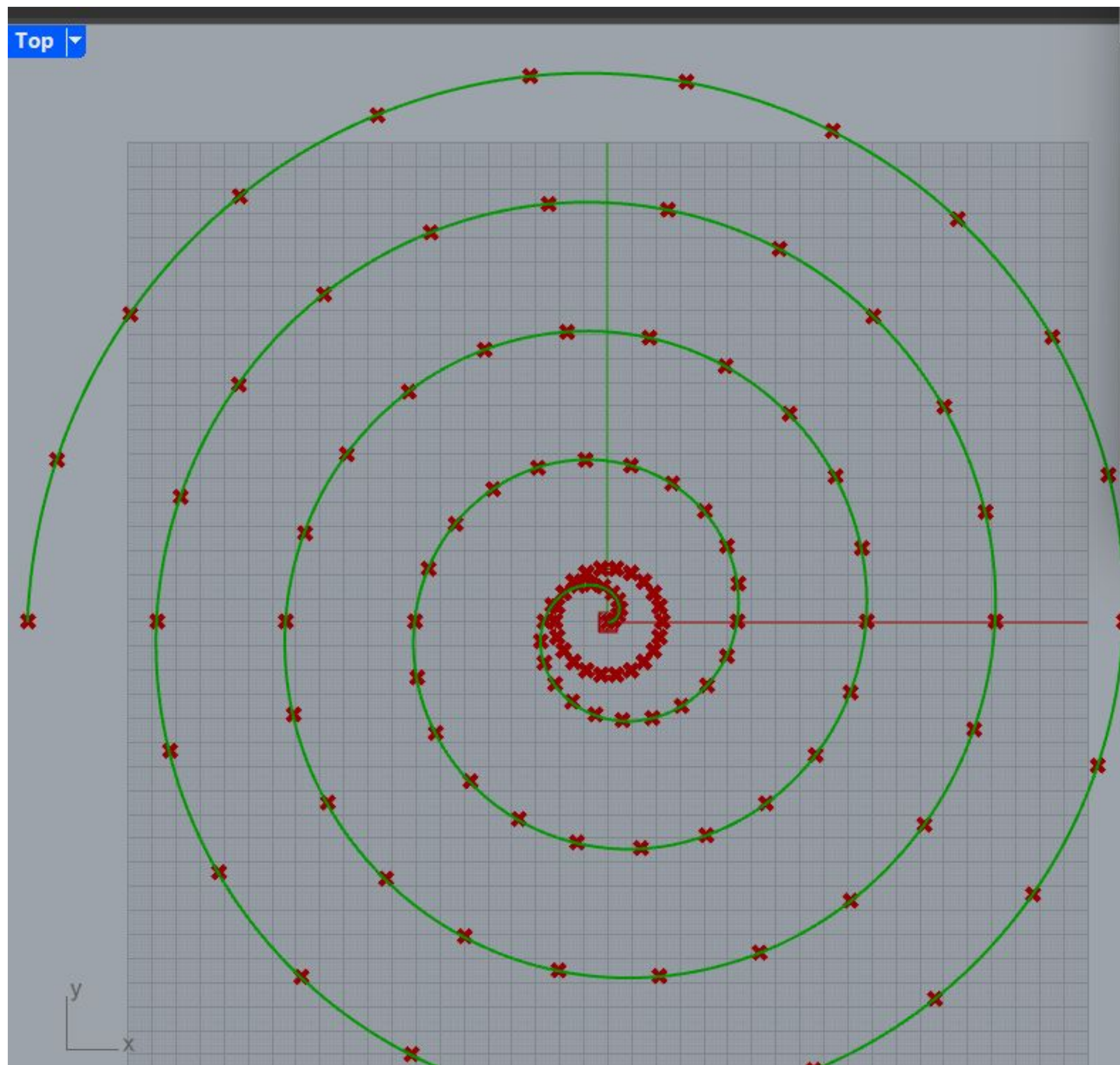


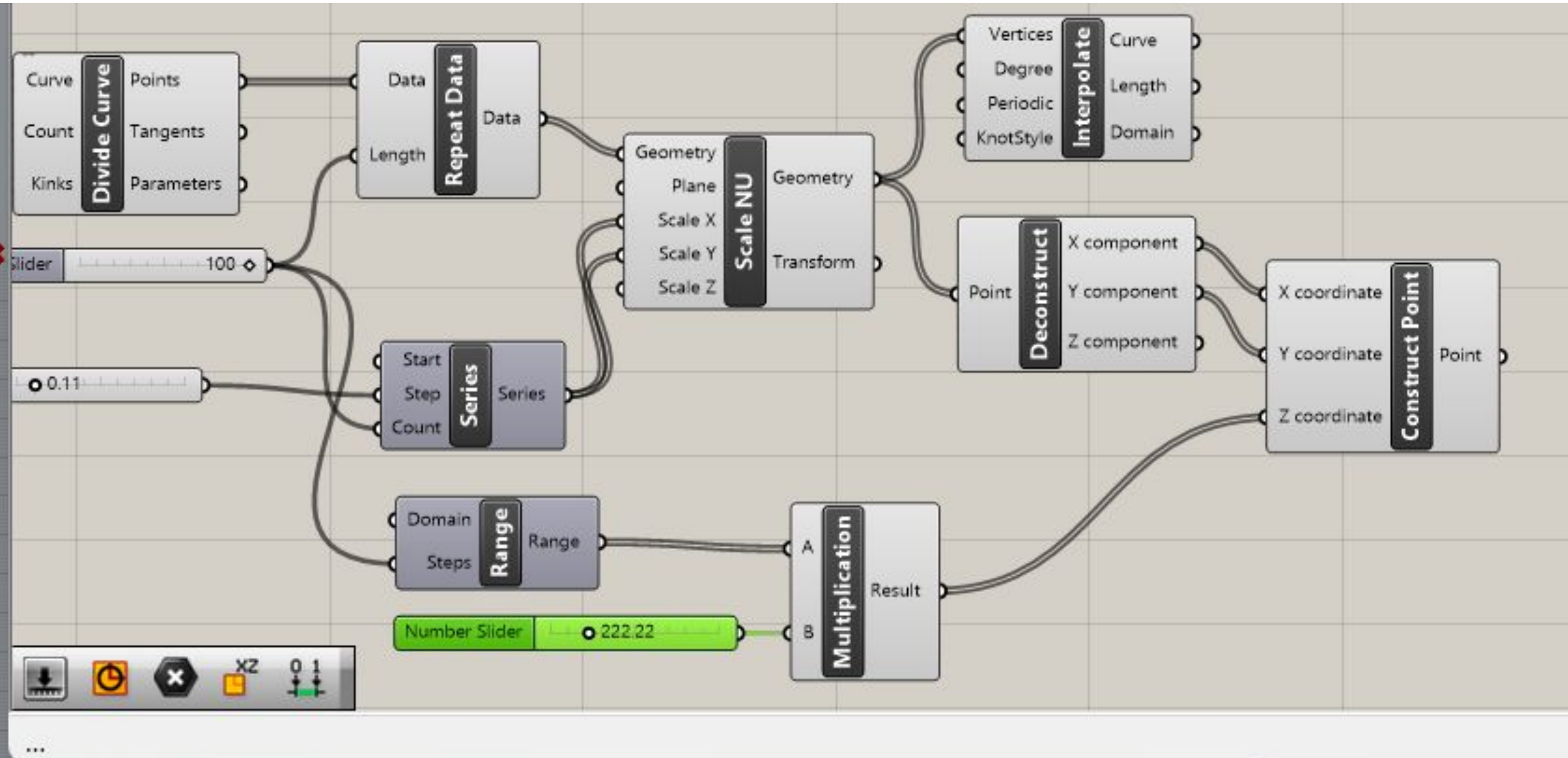
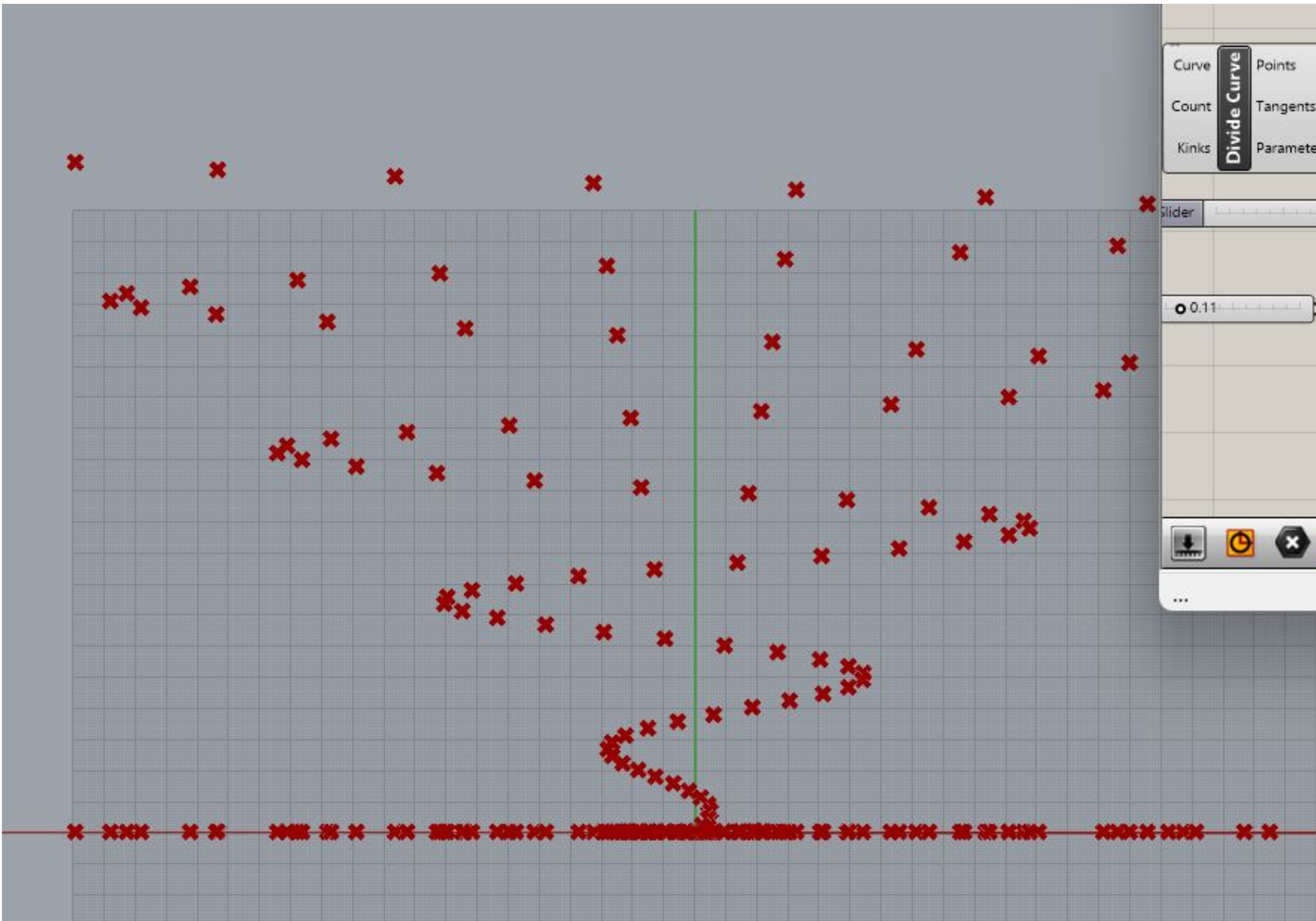


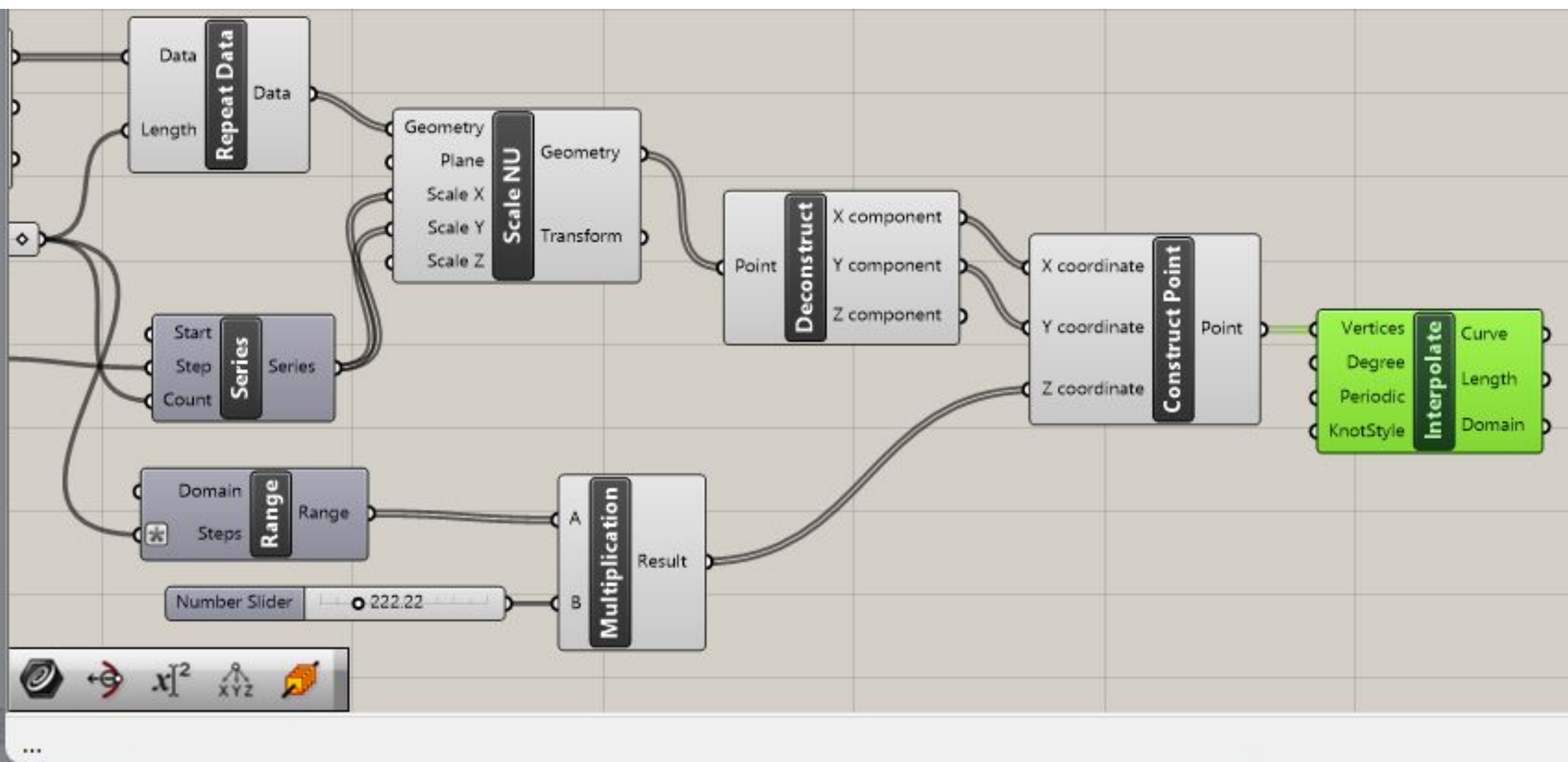
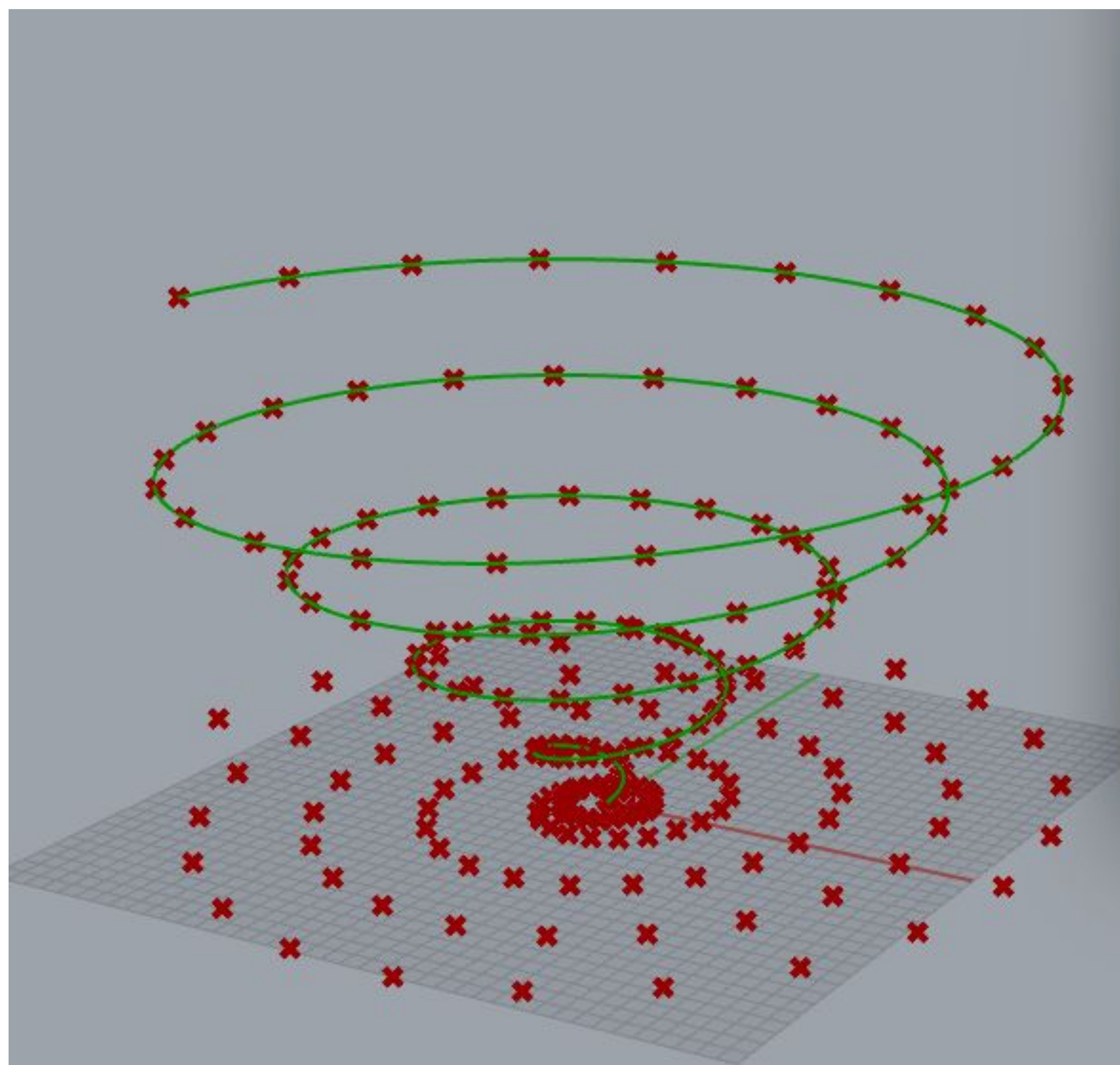


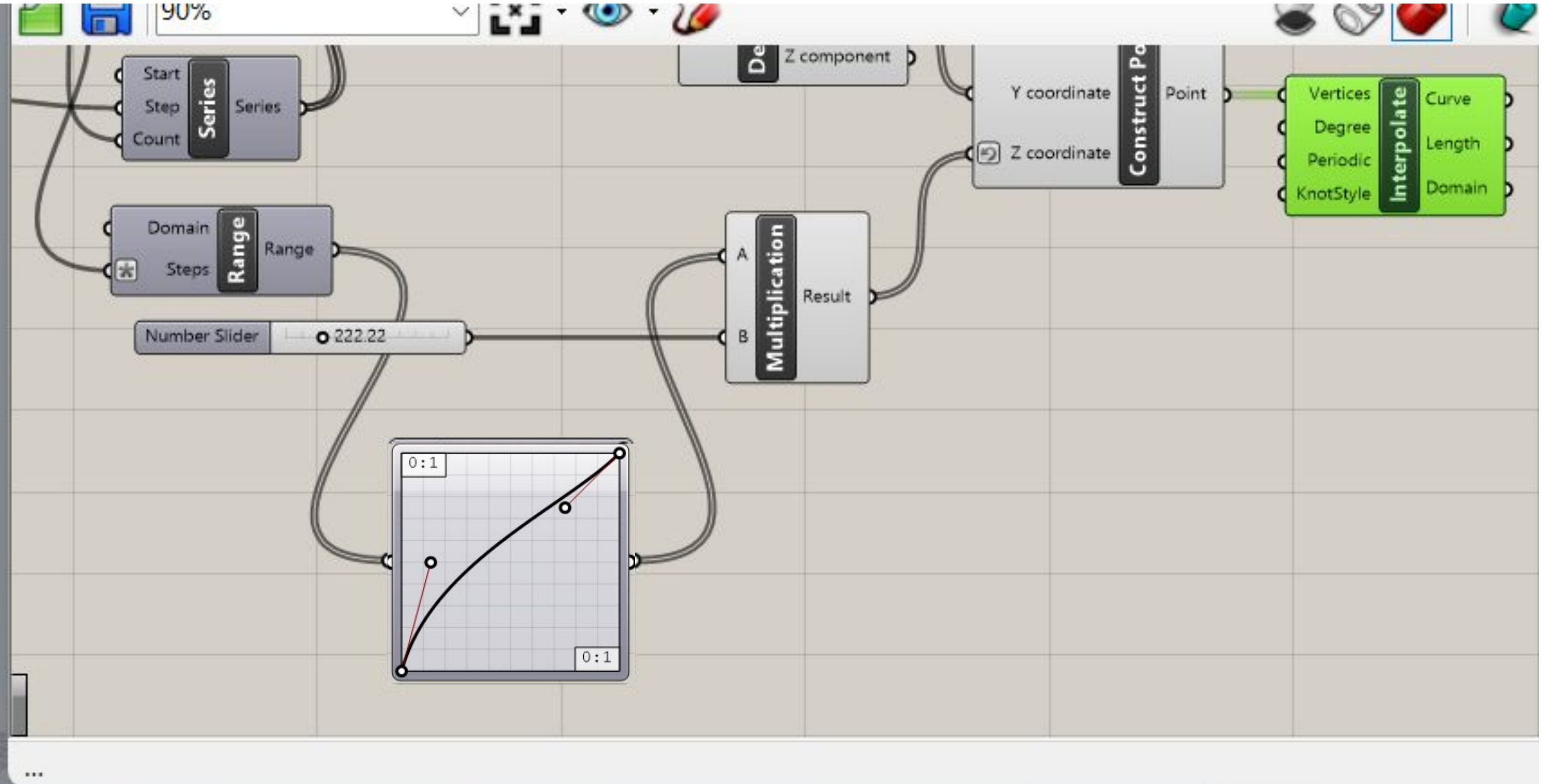
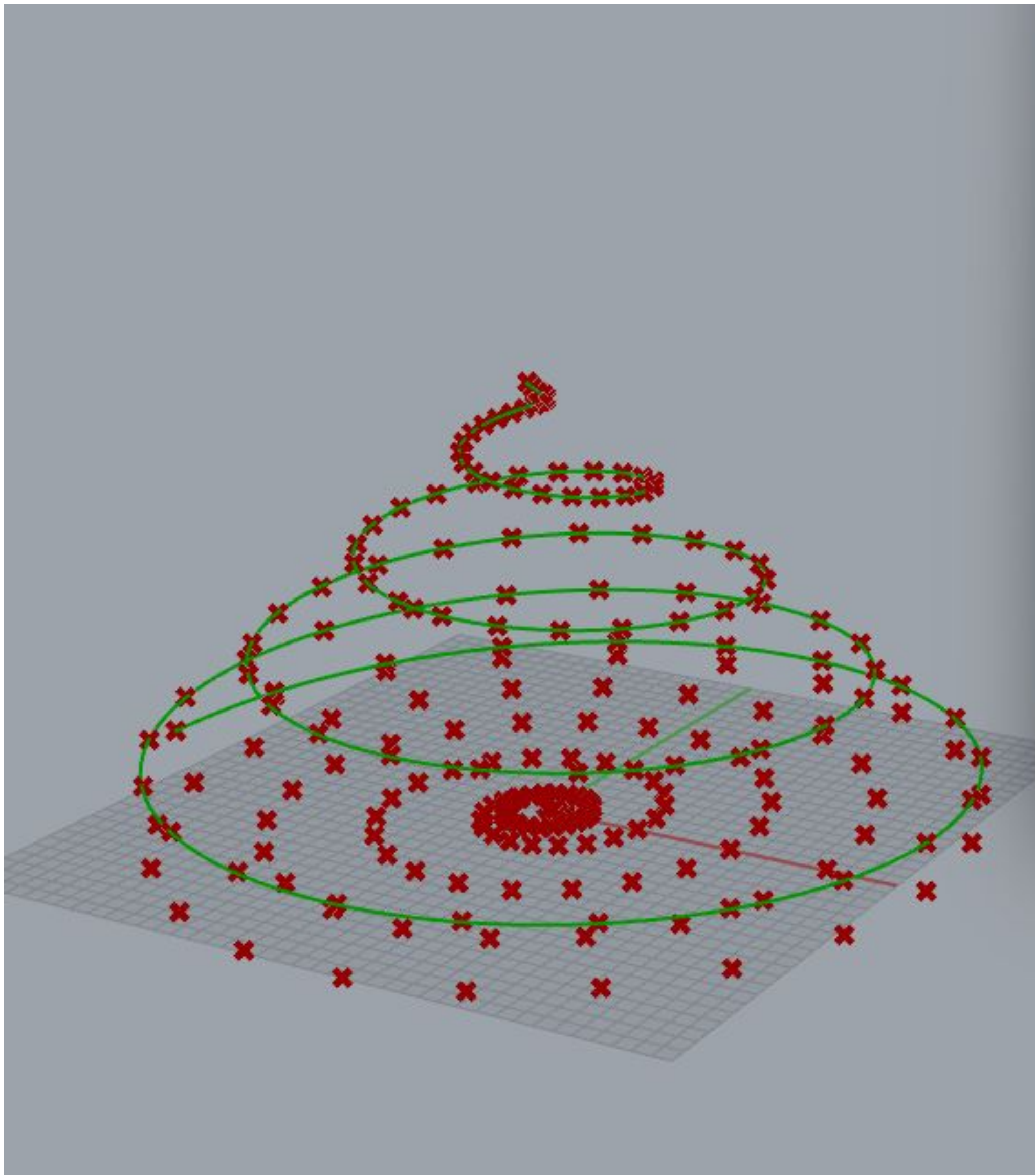
CARACOL - GRASSHOPPER - TRABALHO 3

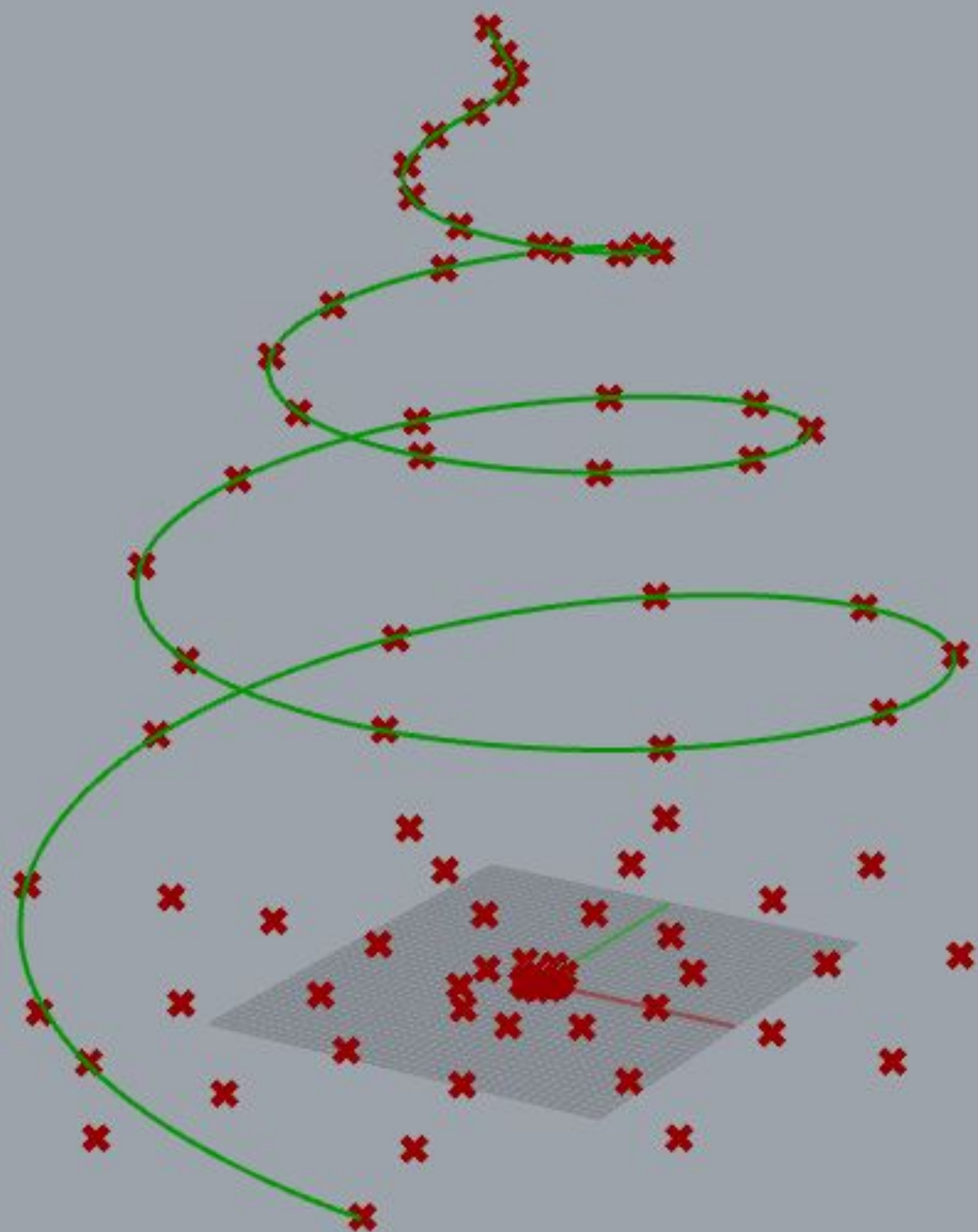








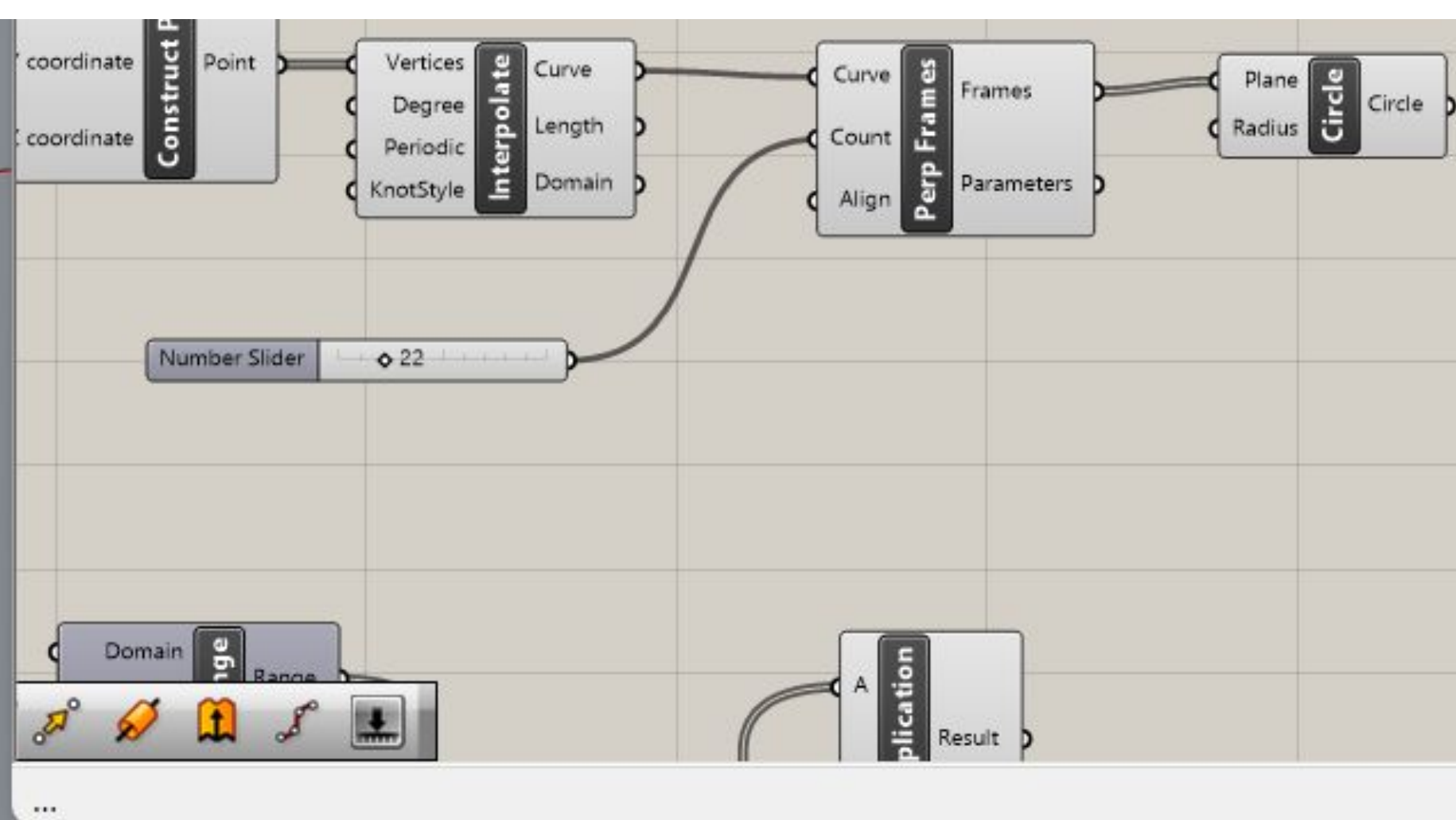




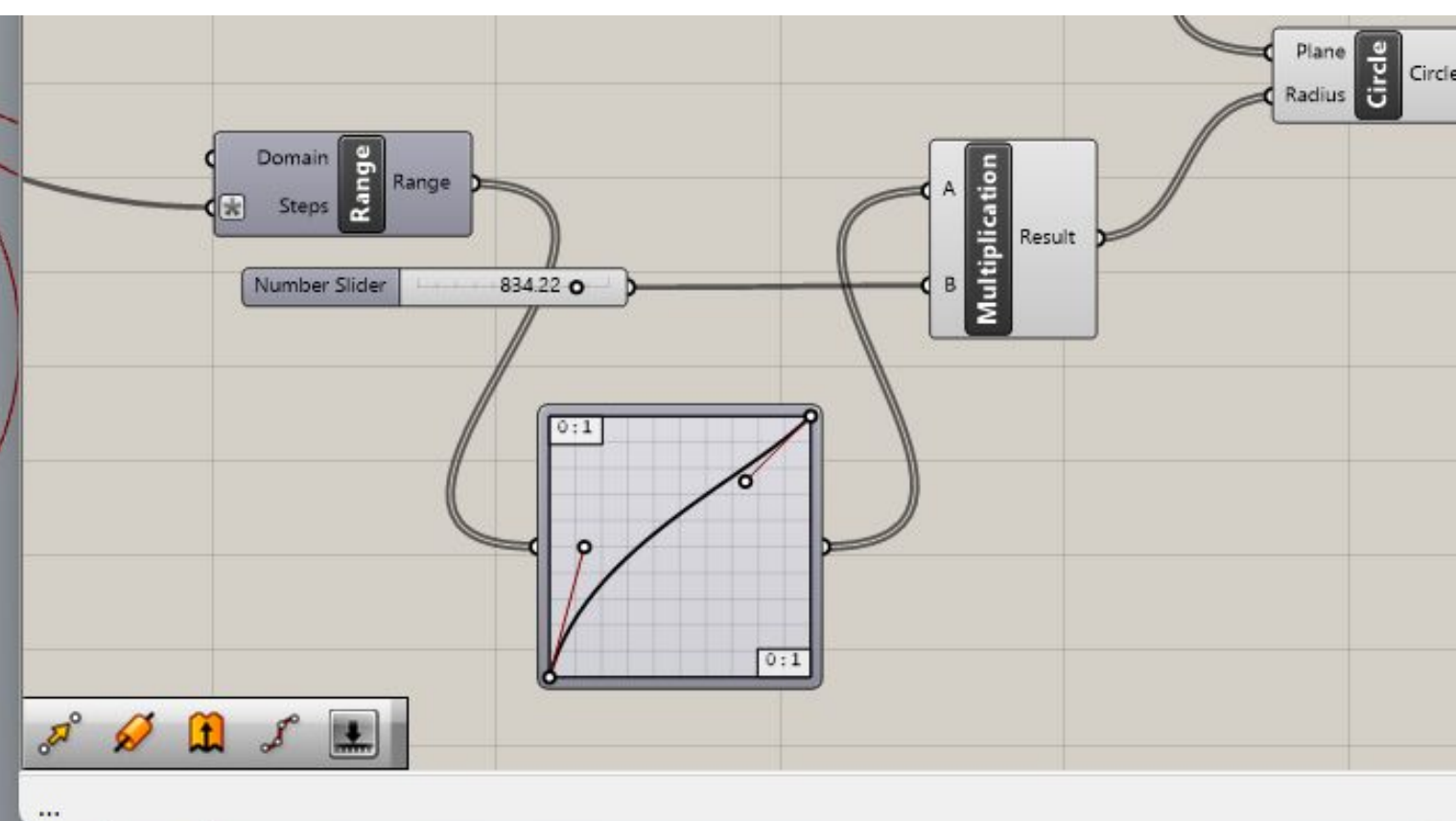
CARACOL - GRASSHOPPER

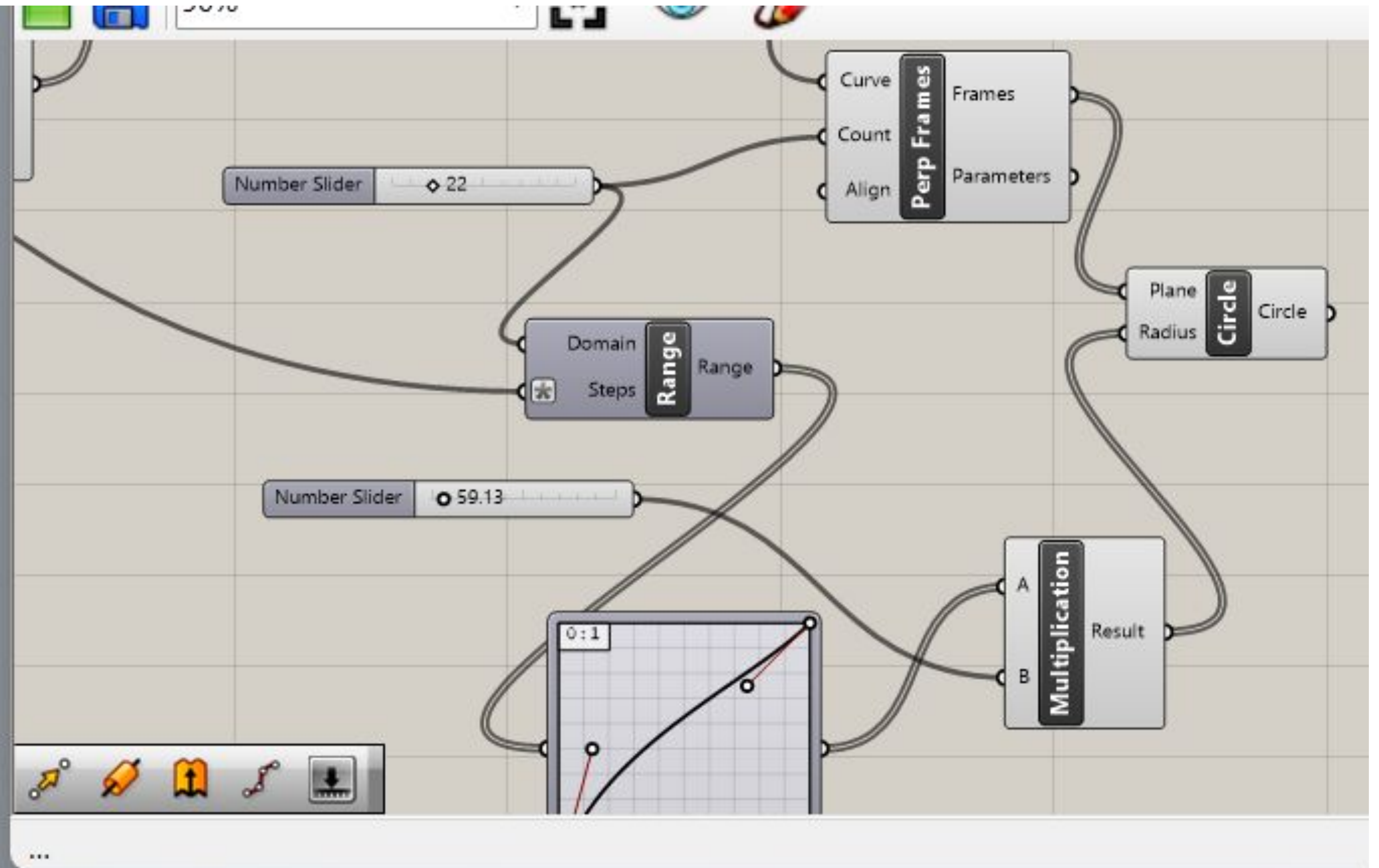
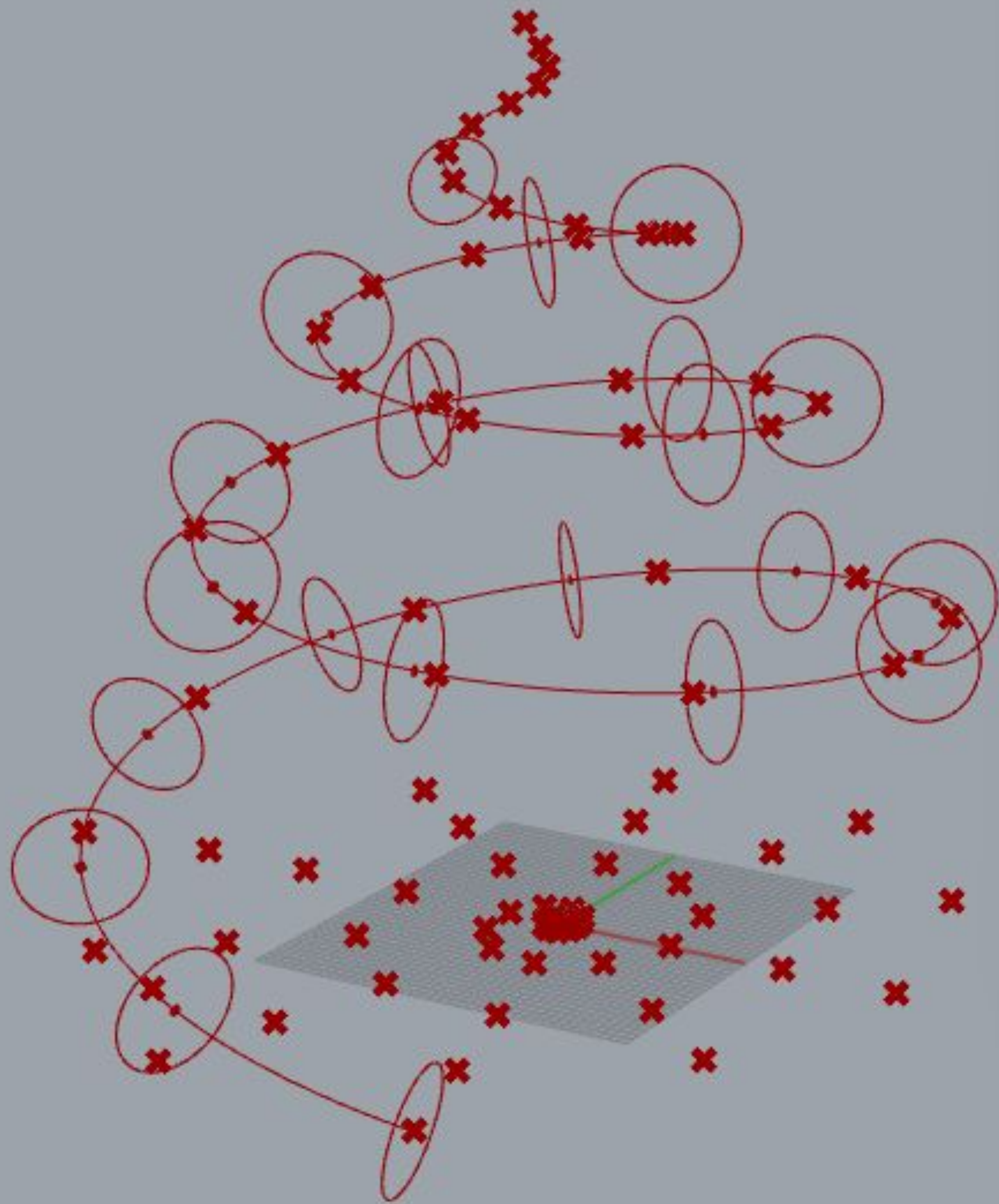
- curve, primitive, CIRCLE (circle ligado ao curve do divide curve)
- number slider com 22.22 (nº qualquer) (ligar ao radius do circle)
- DIVIDE CURVE (points ligado ao data do repeat data)
- number slider 22 (ligado ao count do divide curve)
- REPEAT DATA (data ligado ao geometry do scale NU)
- NUMBER SLIDER 100 (ligado ao length do repeat data e ao count das series)
- SERIES (series ligado ao scale x e Y do scale NU)
- SCALE NU
- NUMBER SLIDER 0.11 (ligado ao step das series)
- curve, spline, INTERPOLATE (vértices ligado ao geometry do scale NU) (depois os vértices passam a tar ligados ao point do constructo point)
- vetor, point, deconstruct e constructo point (point do deconstruct ligado ao geometry do scale NU) (x componente ligado ao x coordinate do constructo point - o mesmo para o Y)
- range (steps ligado ao number slider 100)
- multiplicaton (A ligado ao range), (result ligado ao z coordinate do constructo point)
- number slider 222,22 (ligado ao B do multiplication)
- IR AO STEPS DO RANGE, BOTÃO DIREITO DO RATO, EXPRESSION, "X-1"

- IR AO Z COORDINATE DO CONSTRUCT POINT, BOTÃO DIREITO DO RATO, REVERSE
- GRAFH MAPPER (ligar ao range e ao A da multiplication), (carregar com o botão direito do rato "graft types", "bezier")
- mudar os number sliders para (radius 16.44) (count para 10), (length 39)(step para 0.72) (B para 834.22)

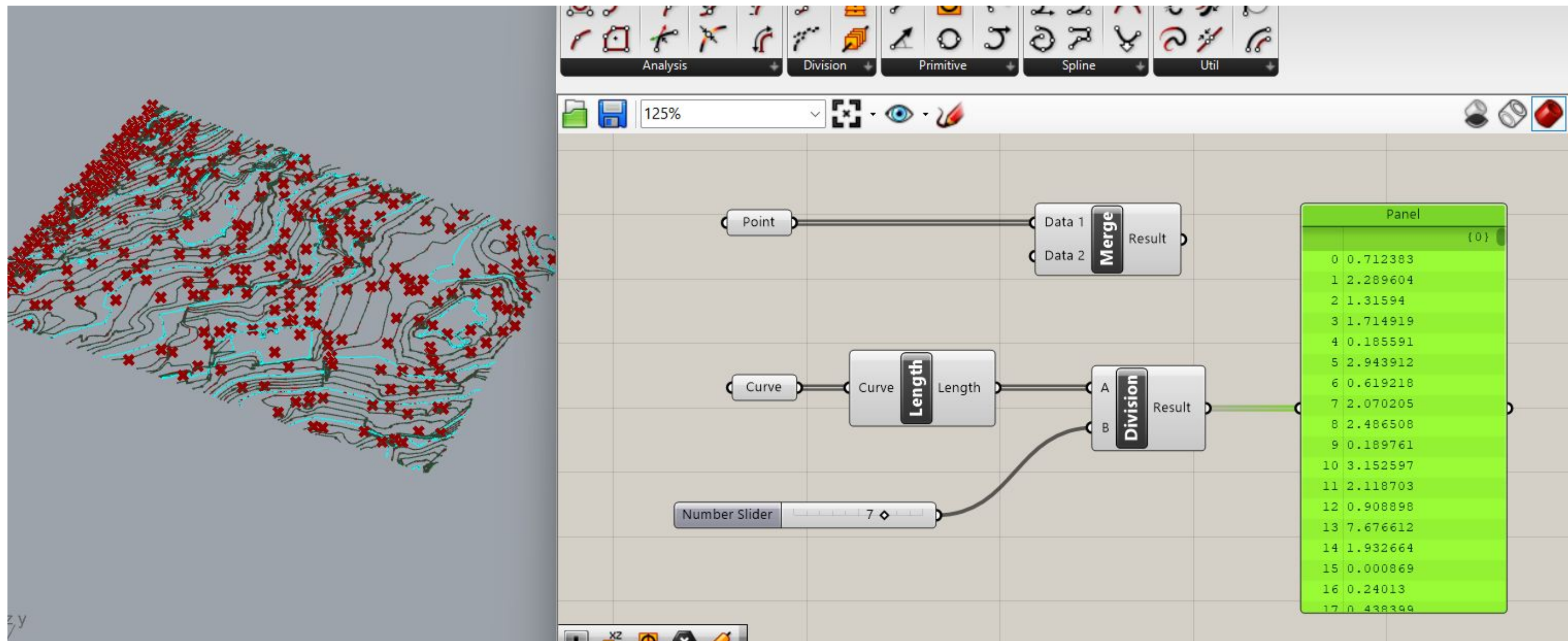
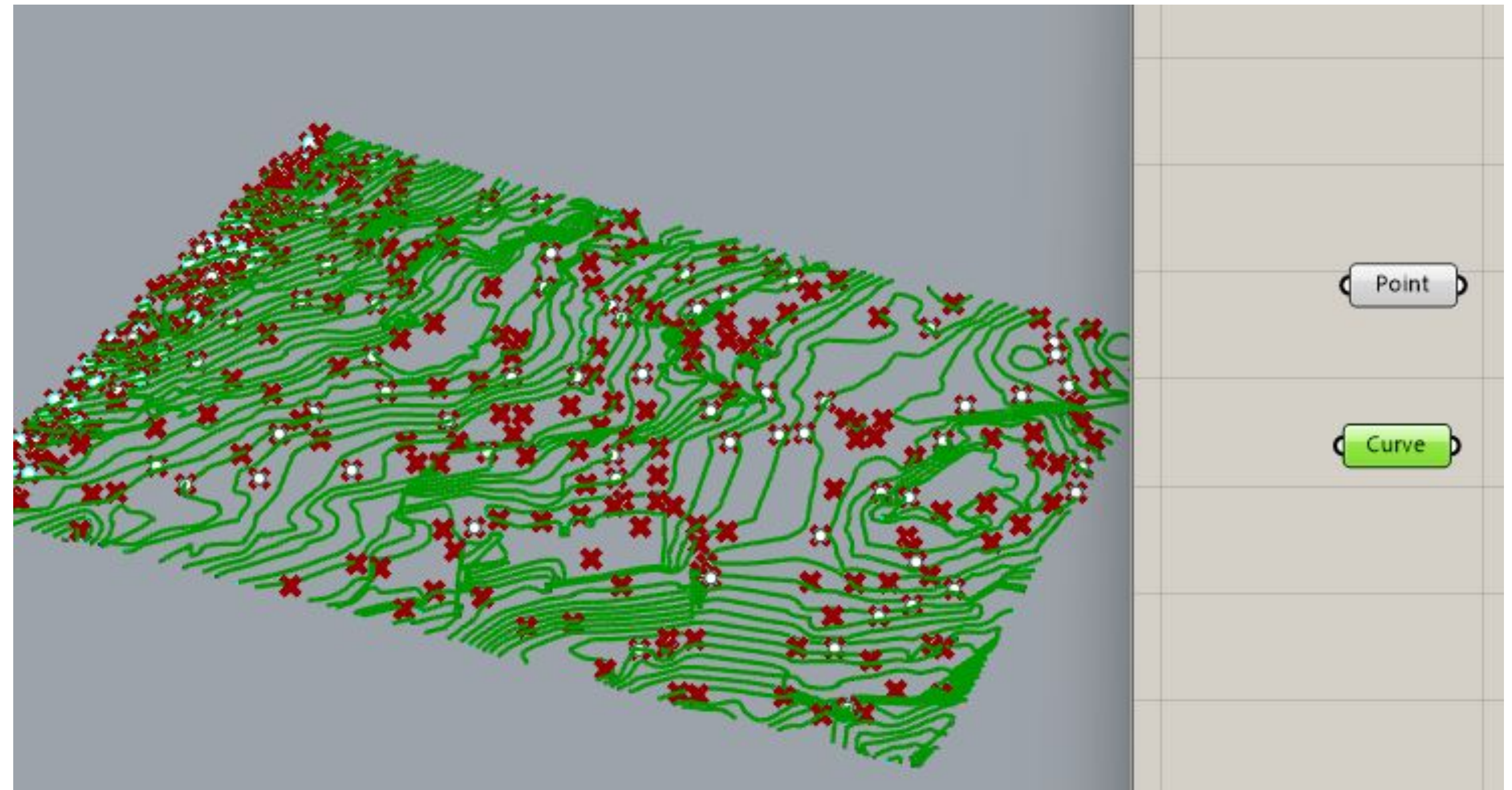
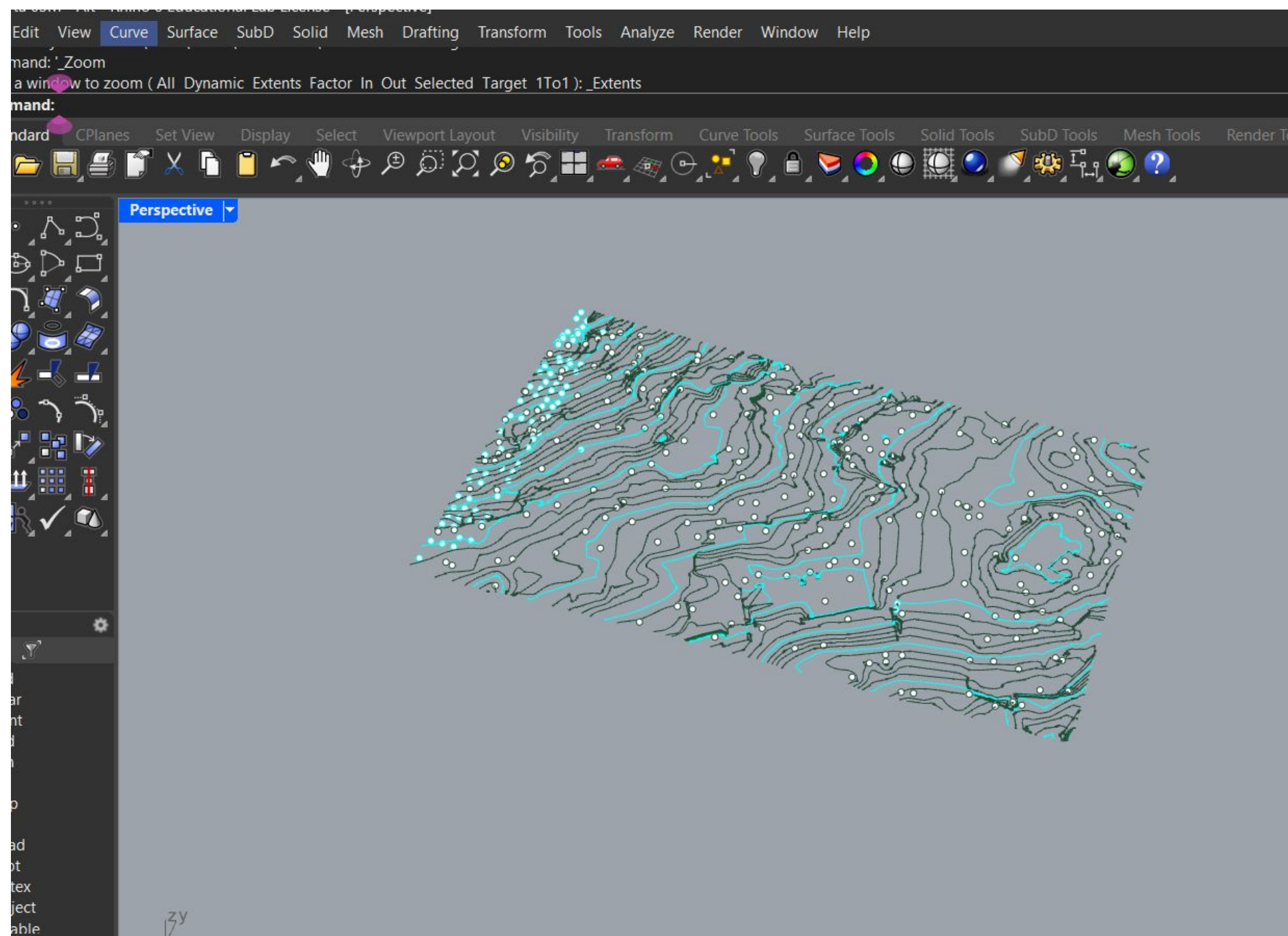


- multiplication ao radius do circle)
- DIMINUIR O VALOR DO NUMBER SLIDER LIGADO AO B





Topografia (Rhino/Grasshopper)



- abrir um novo ficheiro, "Large objects - meters"
- import a topografia
 - fazer um retângulo com @500,300
 - meter um ponto num dos vértices do retângulo
 - grasshopper
 - parameters, point, bot.dirt, set multiple points, seleccionar a topografia toda
 - parameters, curve, bot.dirt, set multiple points, seleccionar a topografia toda
 - merge, (point com data 1
 - length (curve com curve) ligado ao painel permite nos ver a medida das curvas
 - Division (A ligado ao length), (B ligado a number slider 7)

Collect Points from the Topographical Plan

Point

Merging the information points of the terrain



Collect Courbes de Niveaux from the Topographical Plan

Curve

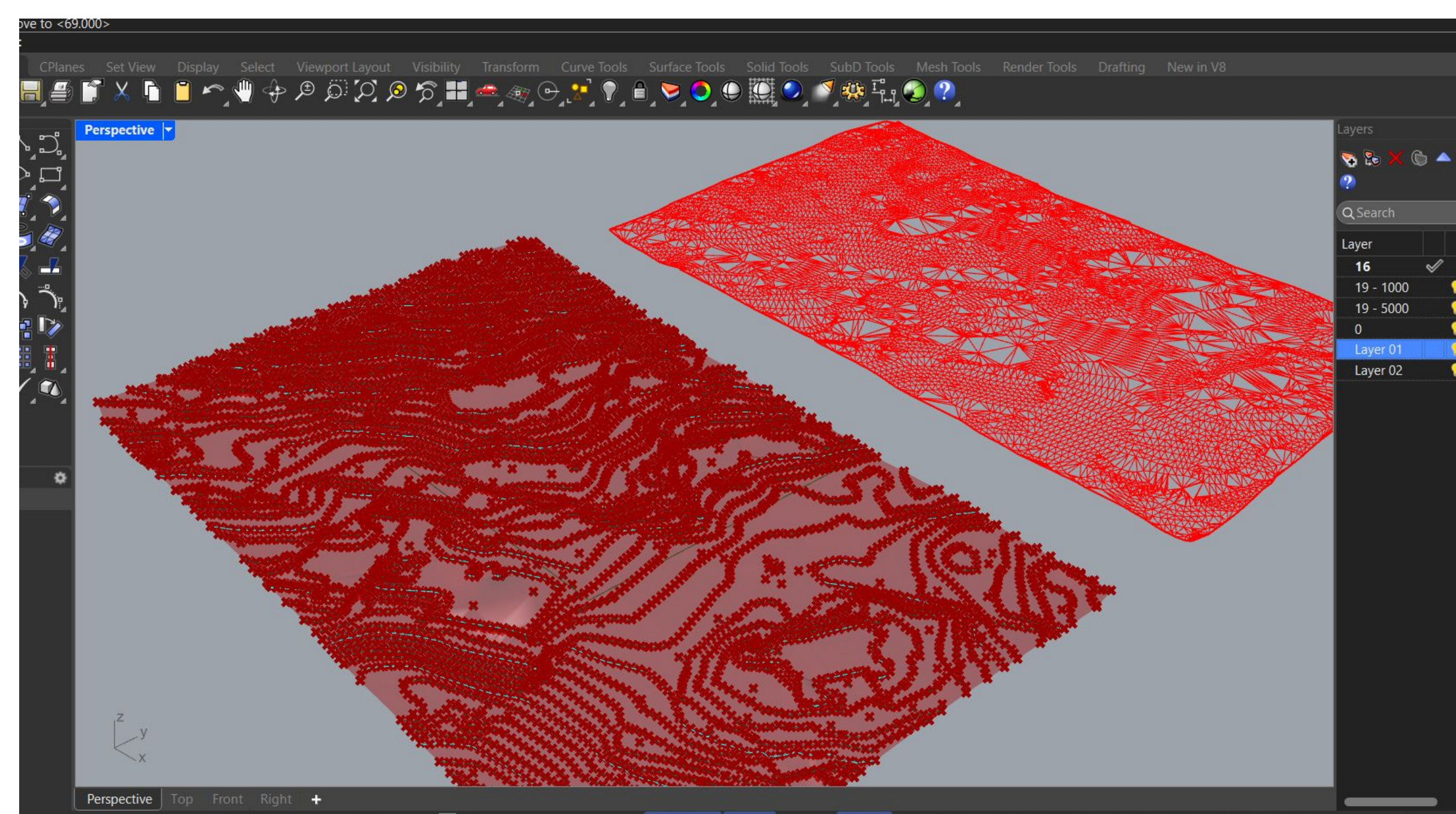


Number Slider 7

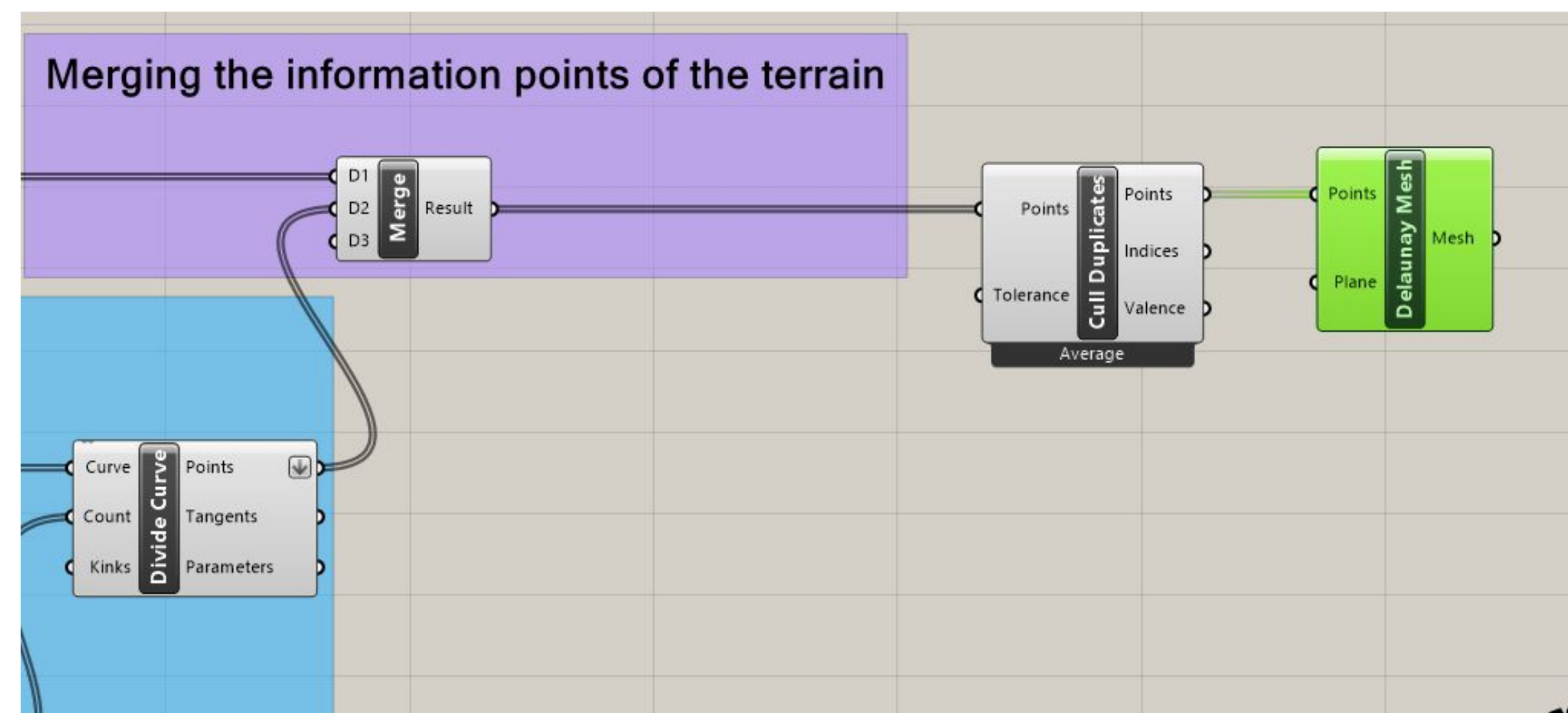


Division of the Curves in equal segments

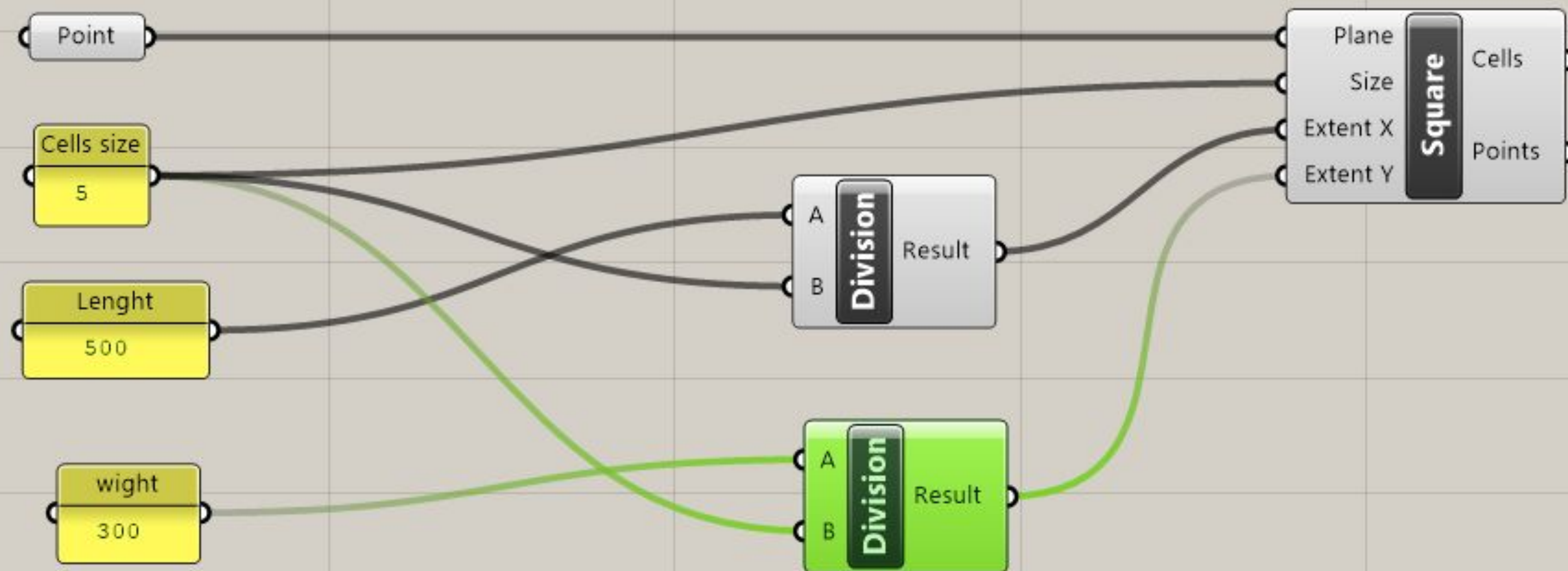




- round (number ligado com o result da Division)
- divide curve (no points, bot, dir, flatten)
- cull duplicates
- delaunay mesh (bot.dir, bake , selecionar uma camada na perspectiva e arrastar a topografia para o lado)
- fazer um retângulo com @500,300, mete lo canto da topografia



Division of the curves in equal segments



- point, set one point e marcar na perspectiva um ponto no canto do retângulo
- square (plane ligado ao point)
- 3 painéis, escrever 500, 300, 5 neles
- 2x division

