Cores em R: uma abordagem dinâmica para curvas planas e mandalas

in: VII Seminário Internacional de Estatística com R

Prof. Dr. João Paulo

24 a 26 de maio de 2023

Resumo

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  - Cores IV - mapas gradientes
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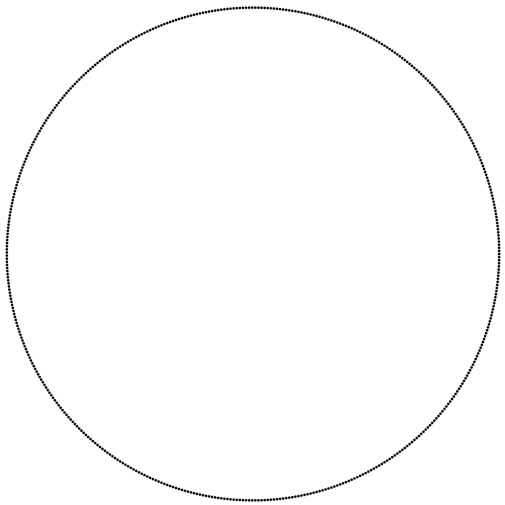
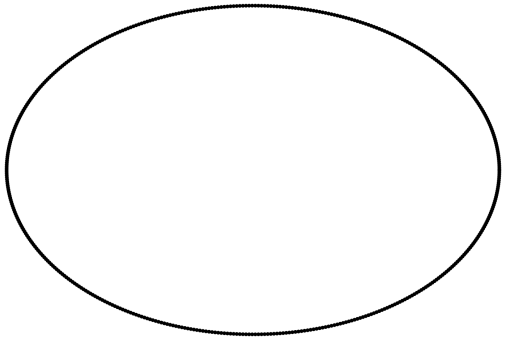
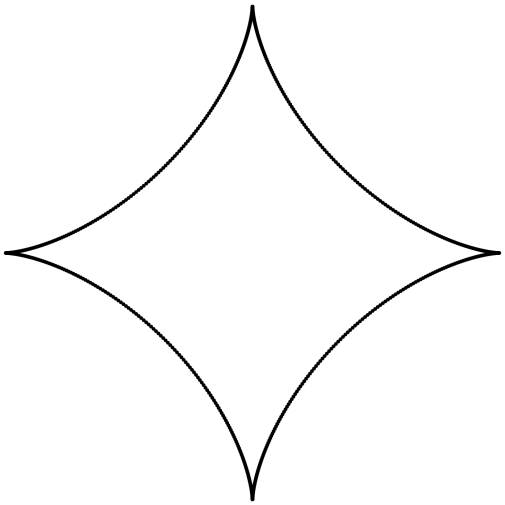
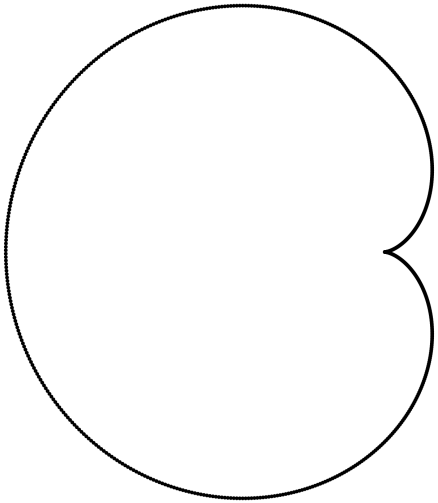
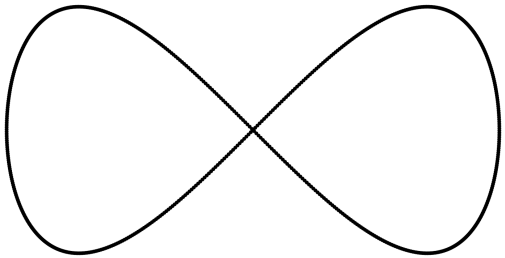
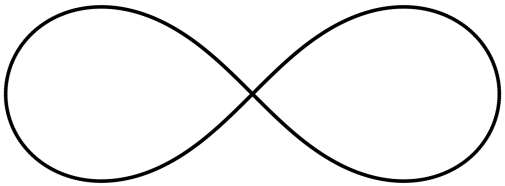
Introdução: VI SER - 2022

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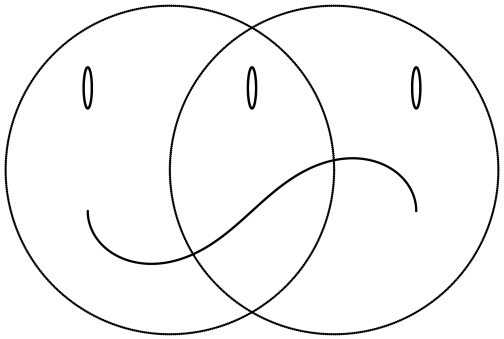
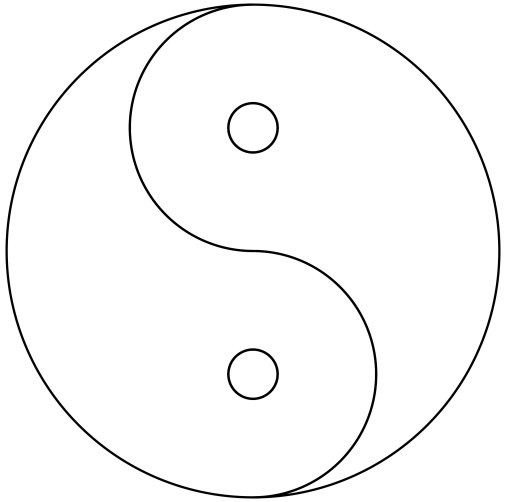
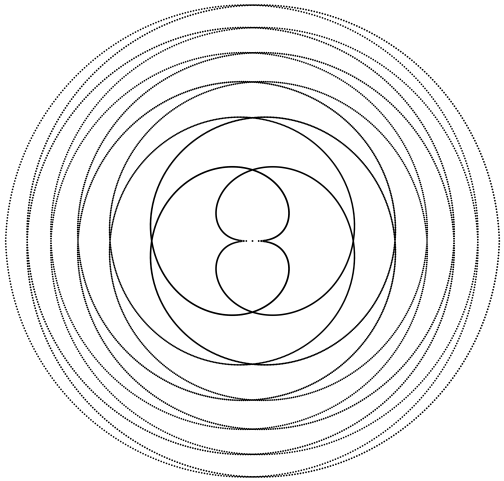
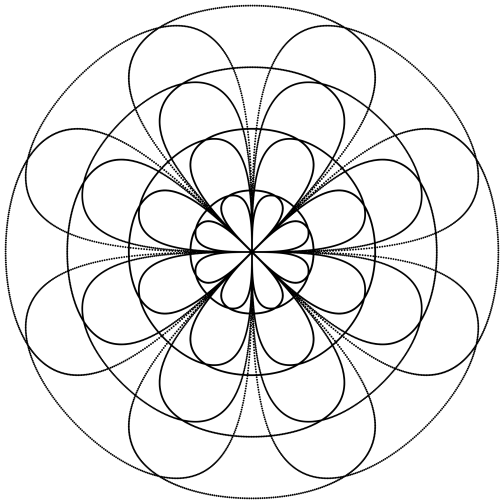
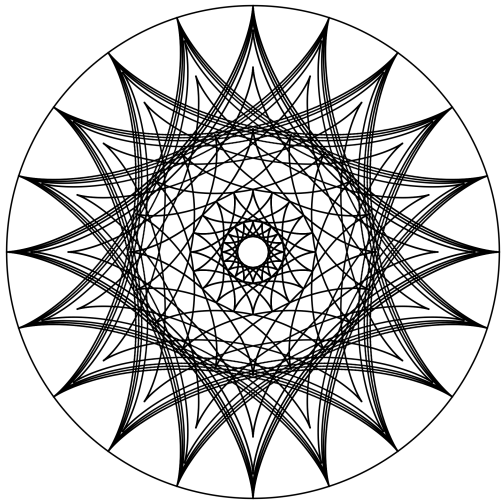
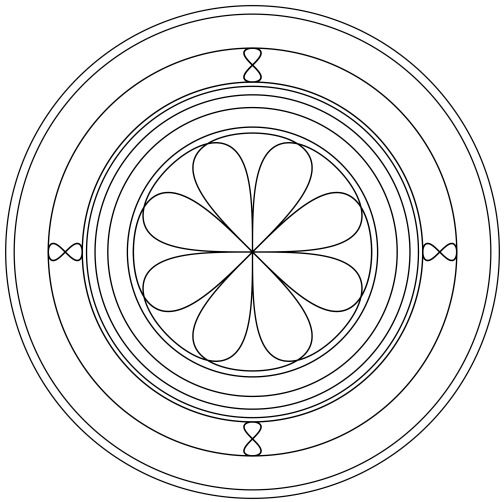

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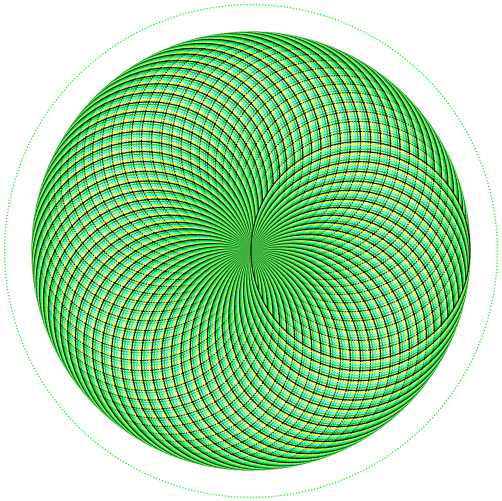
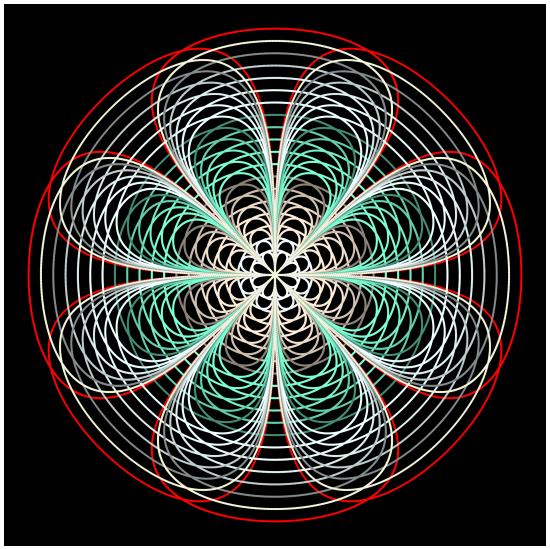
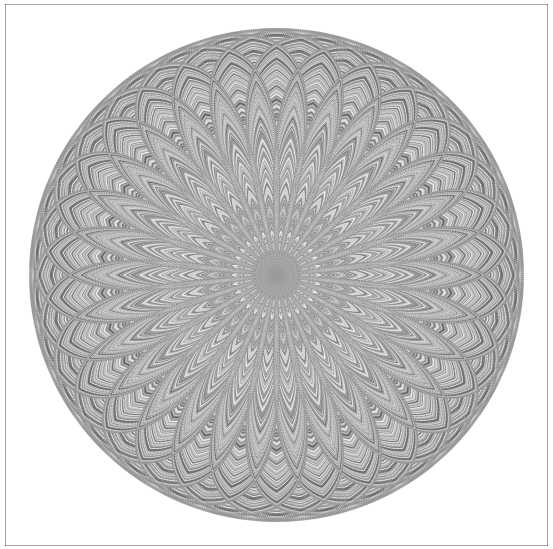
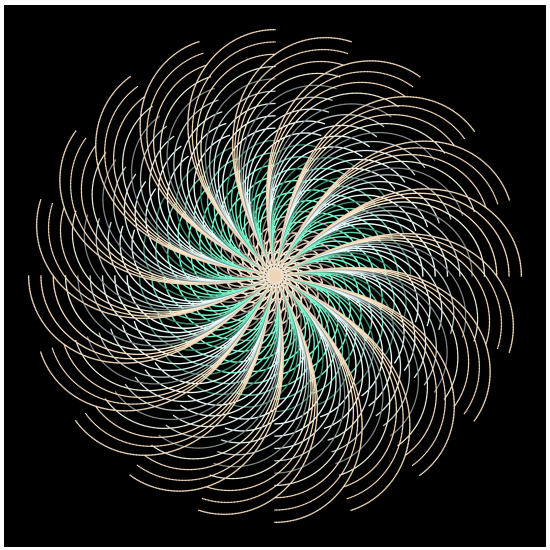
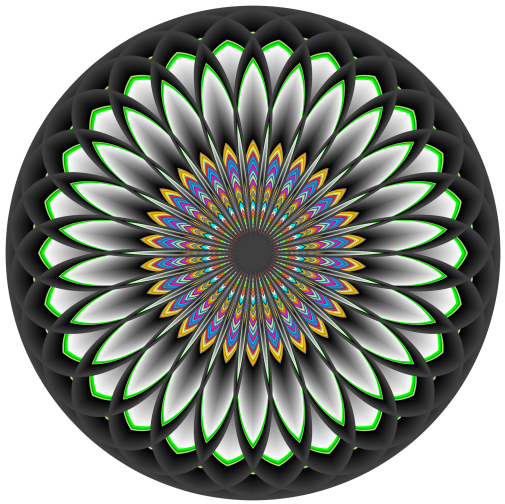
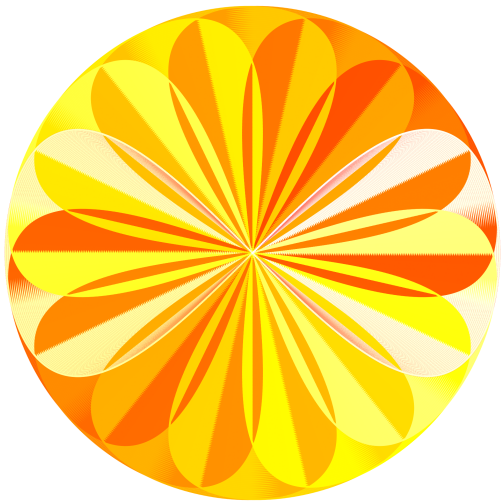












Colaboração

Dra. LUCIANE FERREIRA ALCOFORADO: Docente AFA.

Dr. JOÃO PAULO MARTINS DOS SANTOS: Docente AFA.

Dr. MARCUS VINÍCIUS DE ARAÚJO LIMA: Docente AFA.

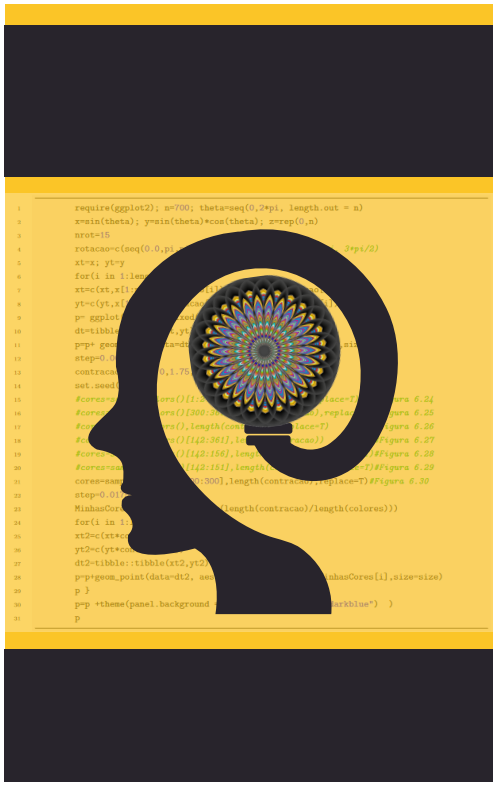
Dr. ALESSANDRO FIRMIANO DE JESUS: Docente AFA.

Dr. JUAN LÓPEZ LINARES: Docente FZEA, USP.

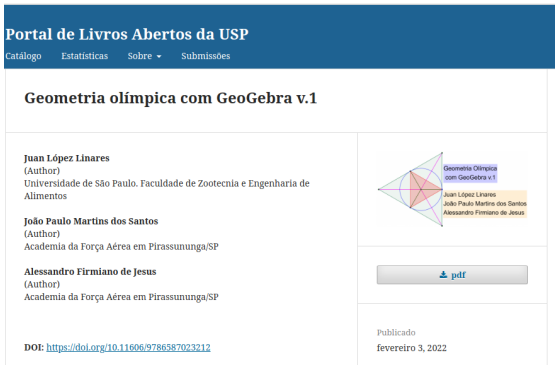
Colaboração

* MandalaR

* Em andamento.



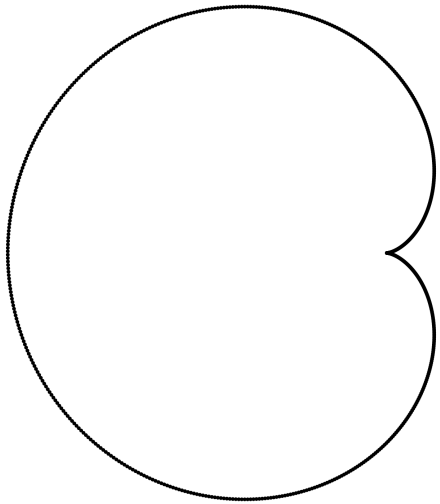
* E-books: v.1, v.2, v.3.

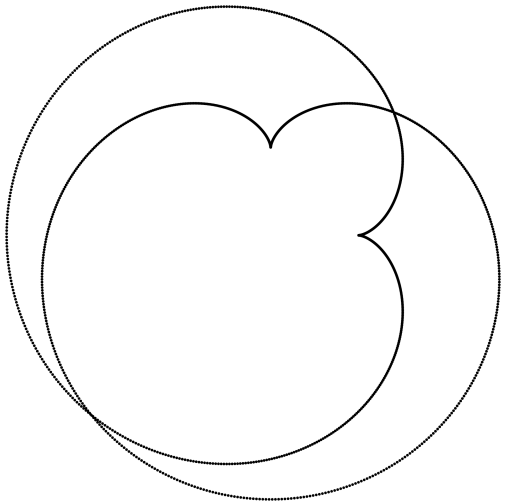


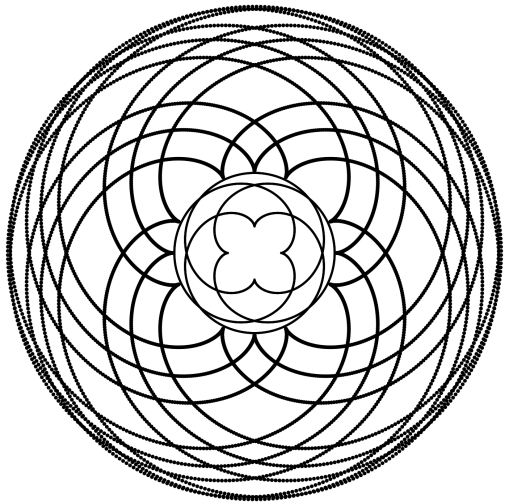
Procedimento

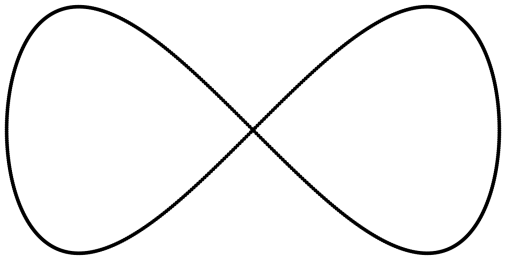
- Escolher as curvas ou figuras geométricas.
  - curvas clássicas: lemniscata de Bernouli, lemniscata de Gerono, deltoide, astroide, entre outras.
  - figuras geométricas: triângulos, retângulos, polígonos regulares, etc.
- Aplicar transformações geométricas:
  - rotação.
  - translação.
  - homotetia.
- Realizar a escolha do modelo de cores e escolha da paleta de cores.
  - R possui 657 cores disponíveis+pacotes.
- Especificar o padrão de cores:
  - quais cores em cada objeto ou objetos.
- Composição de uma ou mais figuras.

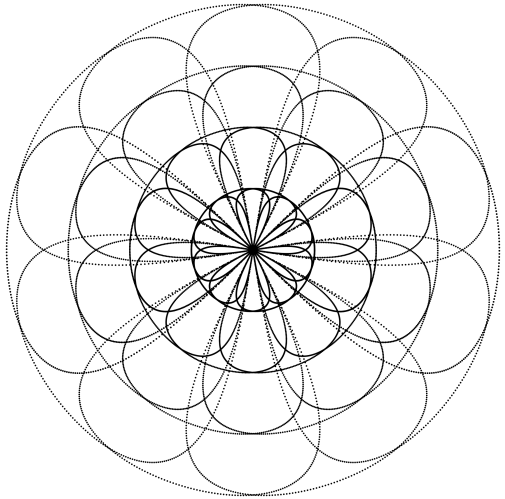
Construções iniciais

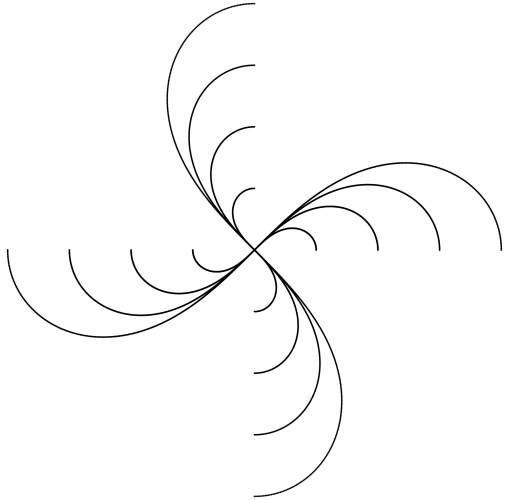




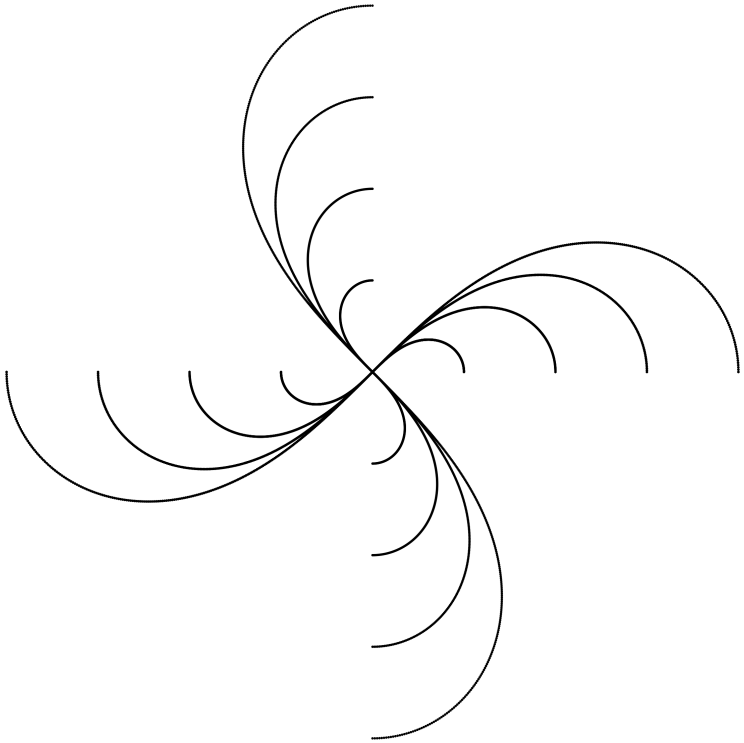




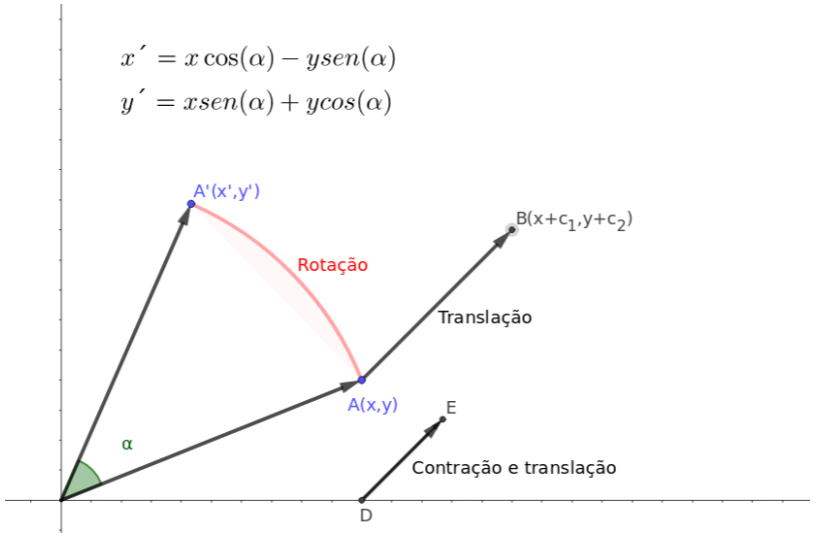




Transformações



$$x' = x\cos(\alpha) - ysen(\alpha)$$
$$y' = xsen(\alpha) + ycos(\alpha)$$



Códigos Gerais

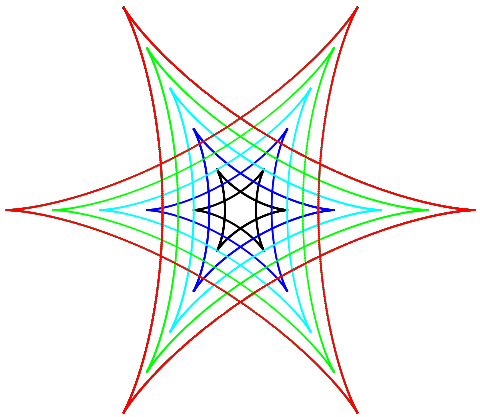
```
install.packages("ggplot2")
library(ggplot2)
install.packages("tidyverse")
library(tidyverse)
```

Códigos

```
#Astroide
require(ggplot2)
n=1000; theta=seq(0,2*pi, length.out = n)
x=2*cos(theta)+cos(2*theta)
y=2*sin(theta)-sin(2*theta)
z=rep(0,n); dt=tibble::tibble(x,y,z)
step=pi#0.125
rotacao=c(seq(0,pi,step)); xt=x; yt=y
p=ggplot()+coord_fixed()+theme_void()
for(i in 1:length(rotacao)){
  xt=c(xt,x[1:n]*cos(rotacao[i])-y[1:n]*sin(rotacao[i]))
  yt=c(yt,x[1:n]*sin(rotacao[i])+y[1:n]*cos(rotacao[i]))
  }
```

Códigos

```
red=c(seq(0.2,1,0.2))
cores=c("black","blue","cyan","green","red")
for(i in 1:length(red)){
  xtt=c(xt*red[i])
  ytt=c(yt*red[i])
  dt=data.frame(x=c(xt, xtt), y=c(yt, ytt), z="astroide")
  p=p+geom_point(data=dt, aes(x=x, y=y),size=0.05,
  color=cores[i])
       }
```



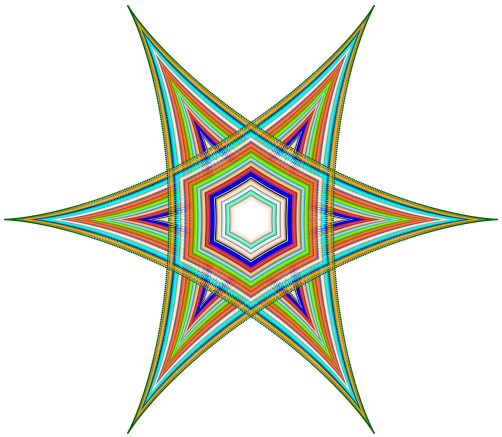
Cores em R

```
[1,] "white"          "aquamarine3" "bisque2"          "blueviolet"
[2,] "aliceblue"      "aquamarine4" "bisque3"          "brown"
[3,] "antiquewhite""azure"          "bisque4"          "brown1"
[4,] "antiquewhite1" "azure1"       "black"             "brown2"
[5,] "antiquewhite2" "azure2"       "blanchedalmond" "brown3"
```

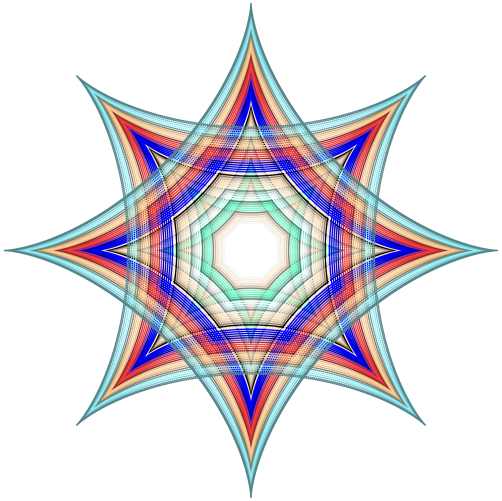
```
for(i in 1:length(red)){
  xtt=c(xt*red[i])
  ytt=c(yt*red[i])
  dt=data.frame(x=c(xt, xtt), y=c(yt, ytt), z="astroide")
  p=p+geom_point(data=dt, aes(x=x, y=y), color=colors()[i],
    size=0.15)      }
p=p +theme(panel.background = element_rect(fill = "black")  )
p
```

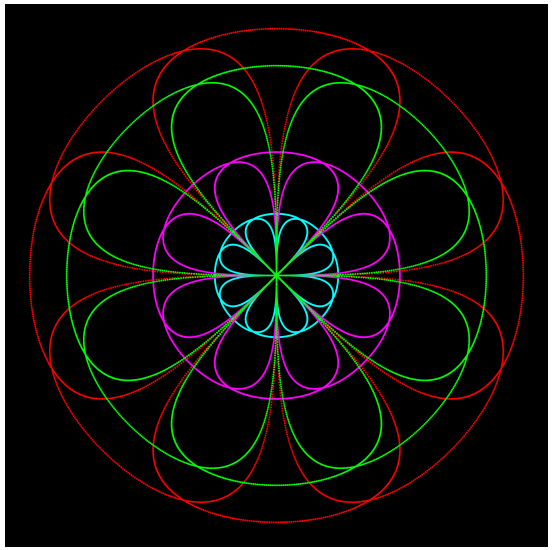
Cores I: Astroide, Deltoide, Lemniscata de Bernouli

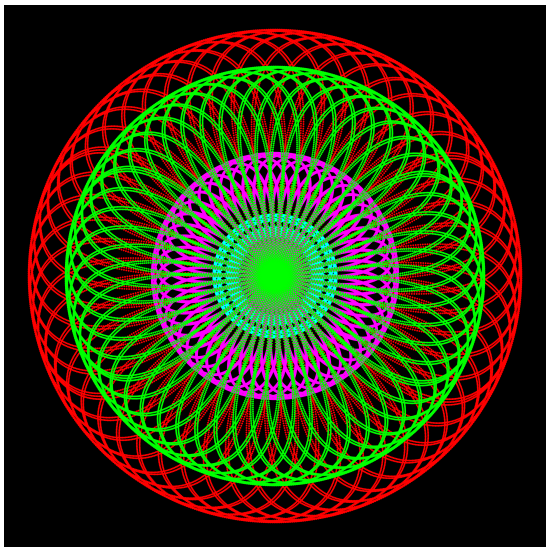
red=c(seq(0.2,1,0.01))

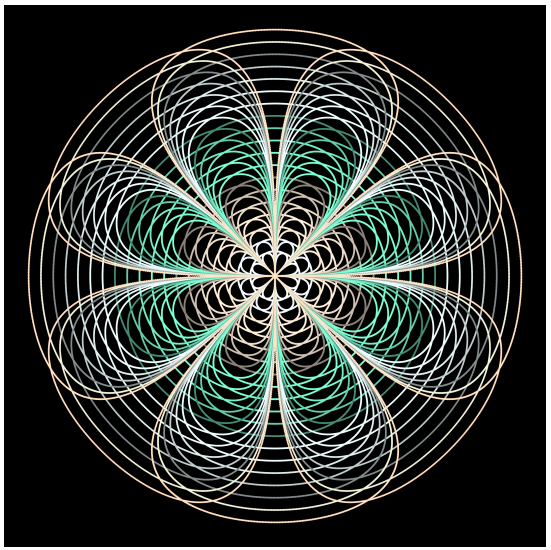


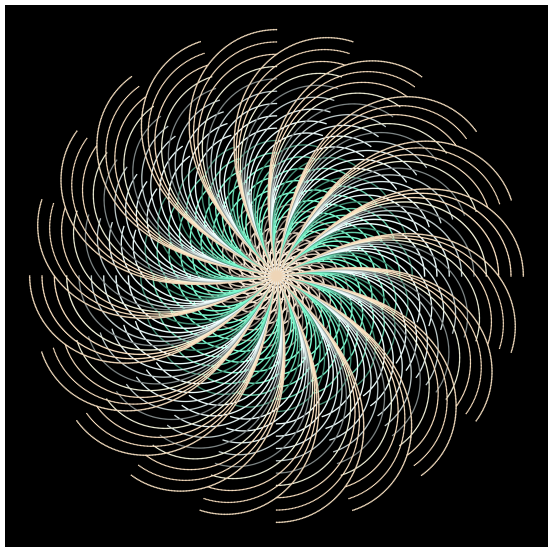
red=c(seq(0.2,1,0.0175))





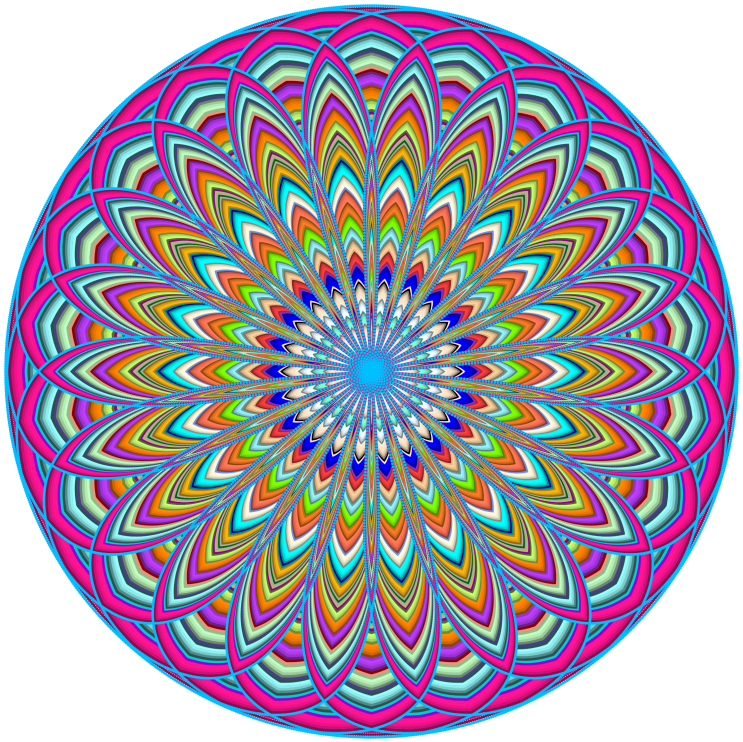


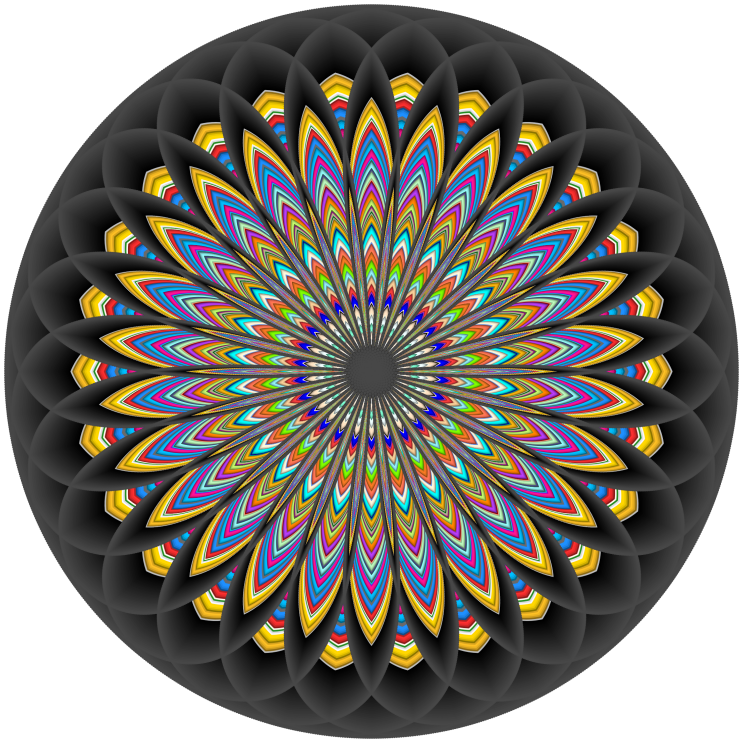




Cores II - escolha sequencial I

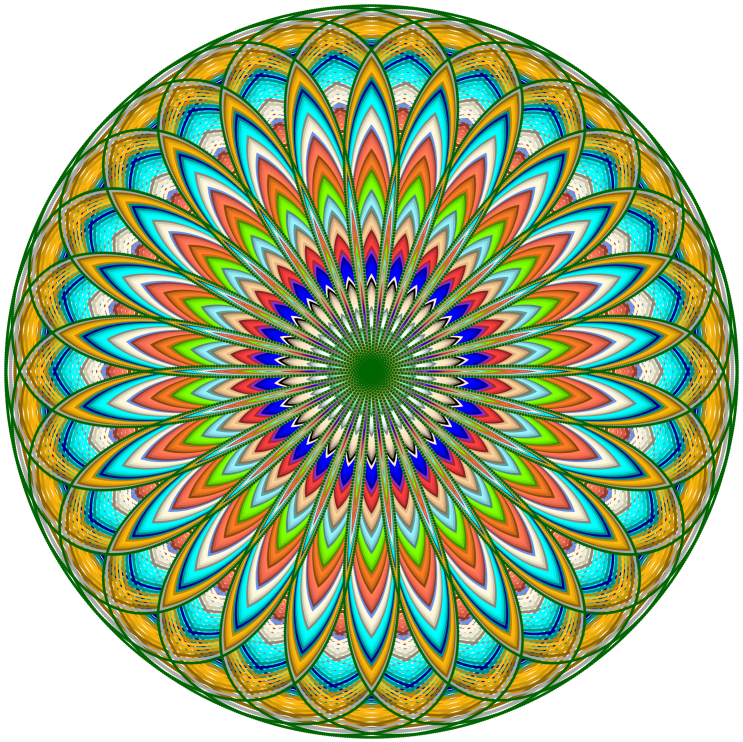
step=0.0075;red=seq(.1,1,by=step); step=0.005;red=seq(.1,1.,by=step);



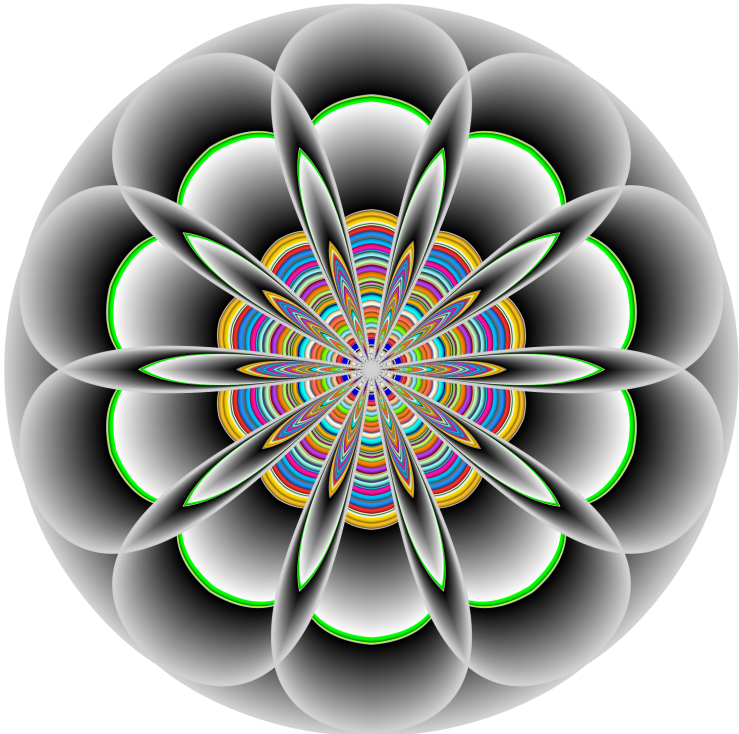


Cores II - escolha sequencial II

"white"-"darkgreen"



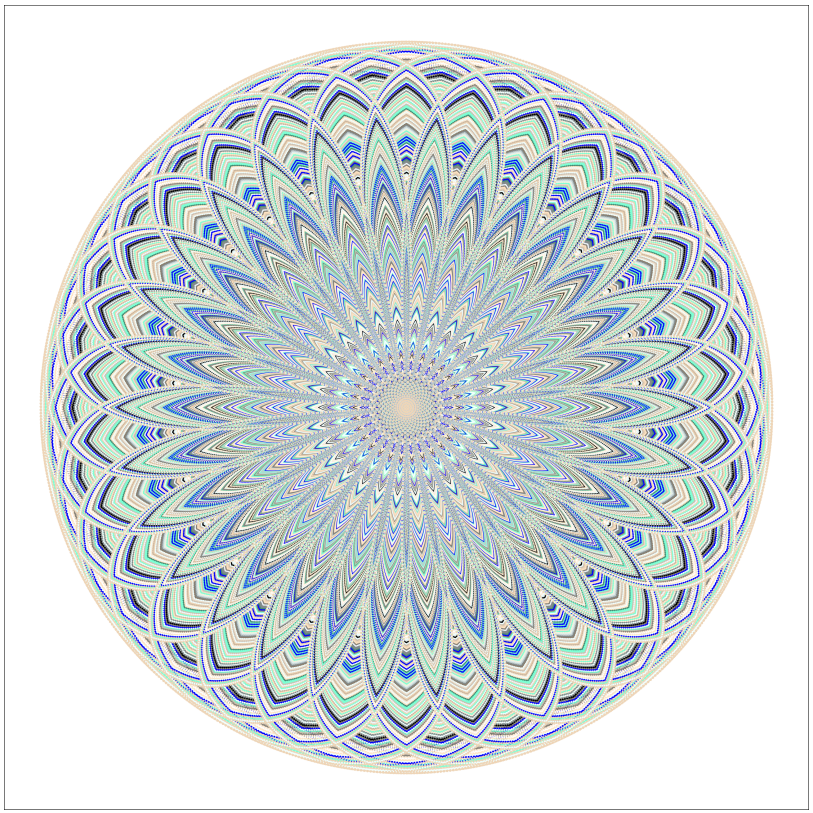
"white"-"grey82"



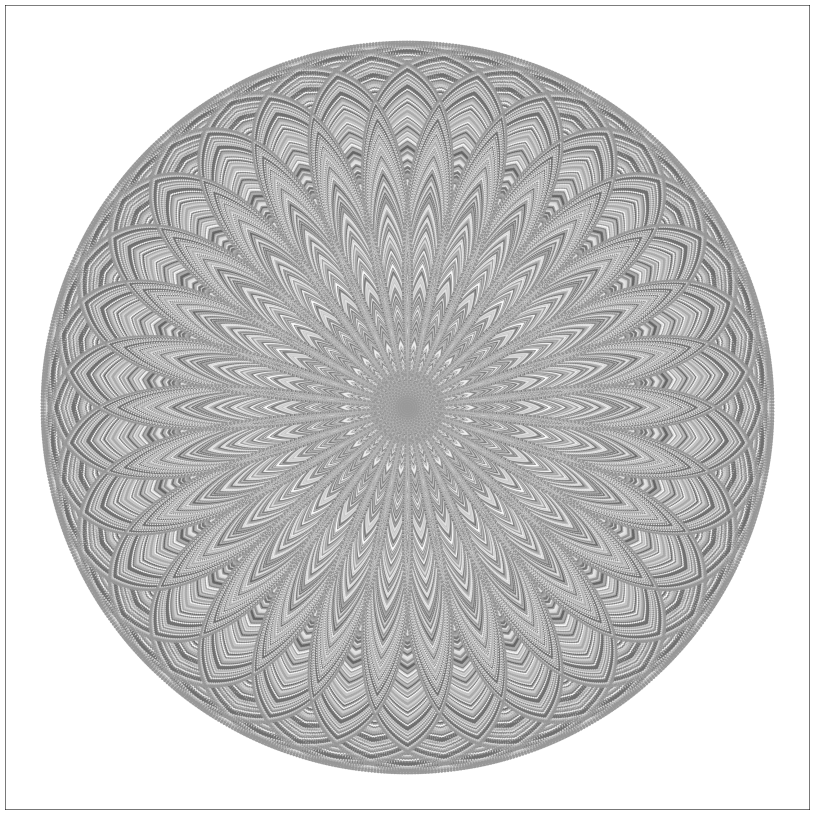
Cores III - escolha aleatória

- cores=sample(colors()[1:27],length(contracao),replace=T)
- MinhasCores=rep(cores,floor(length(contracao)/length(cores))+1)

colors()[1:27]

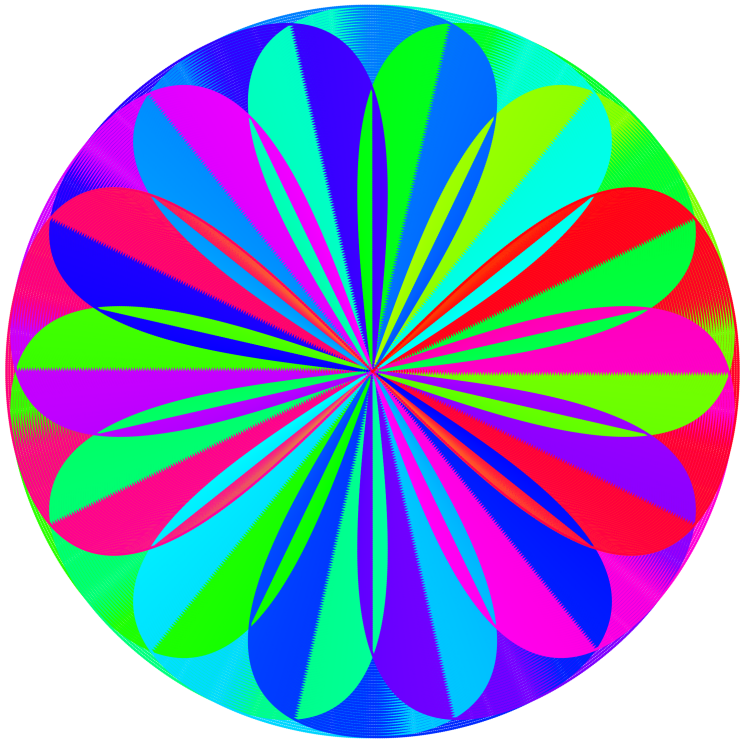


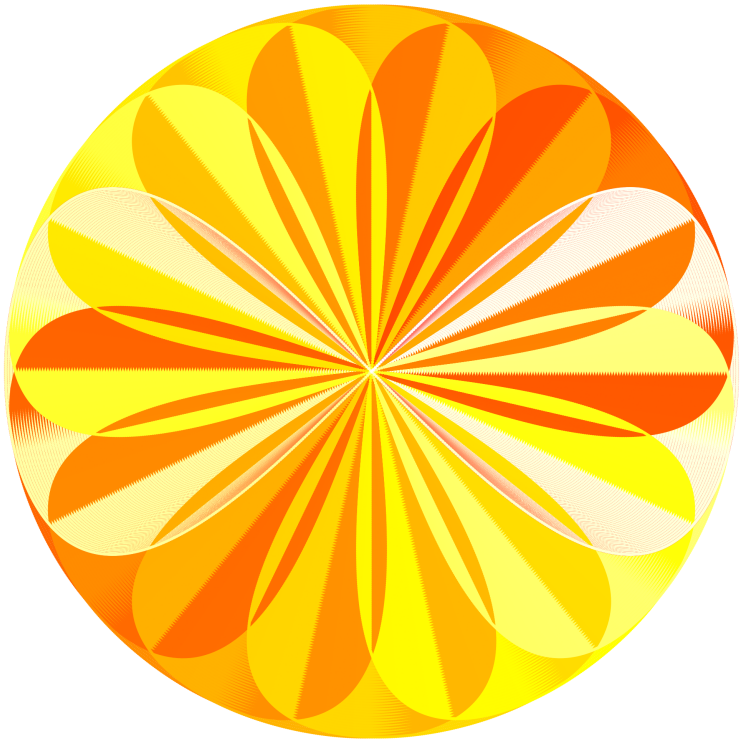
colors()[300:361]



Cores IV - mapas gradientes

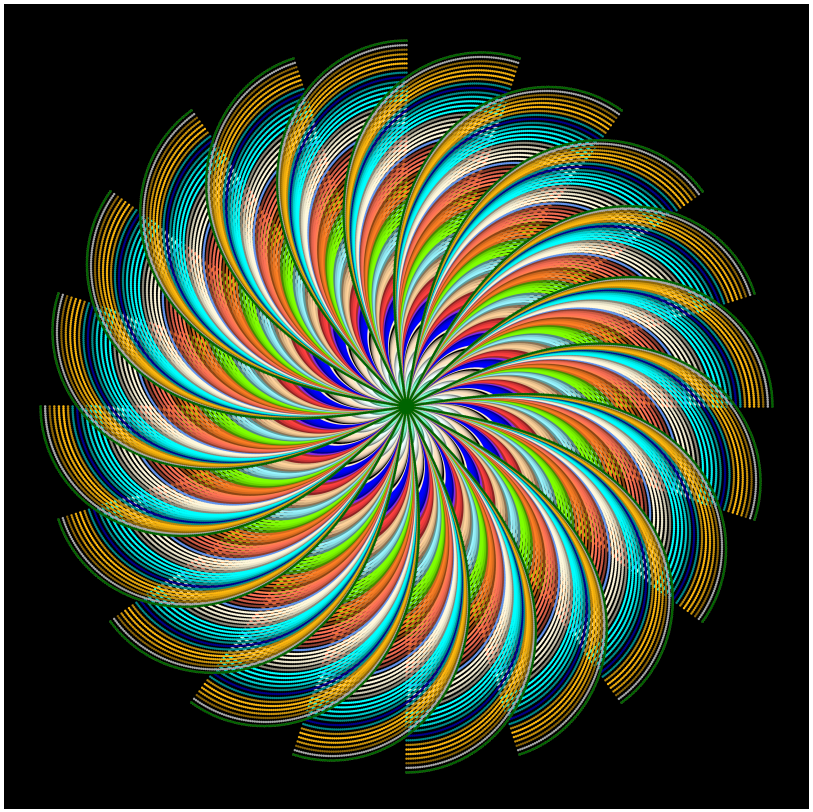
- MyColor=rainbow((nrot+2)*length(x), s = 1, v = 1, start = 0, end = max(1, n - 1)/n, alpha = 1)
- require(colorspace); MyColor=heat.colors((nrot+2)*length(x))

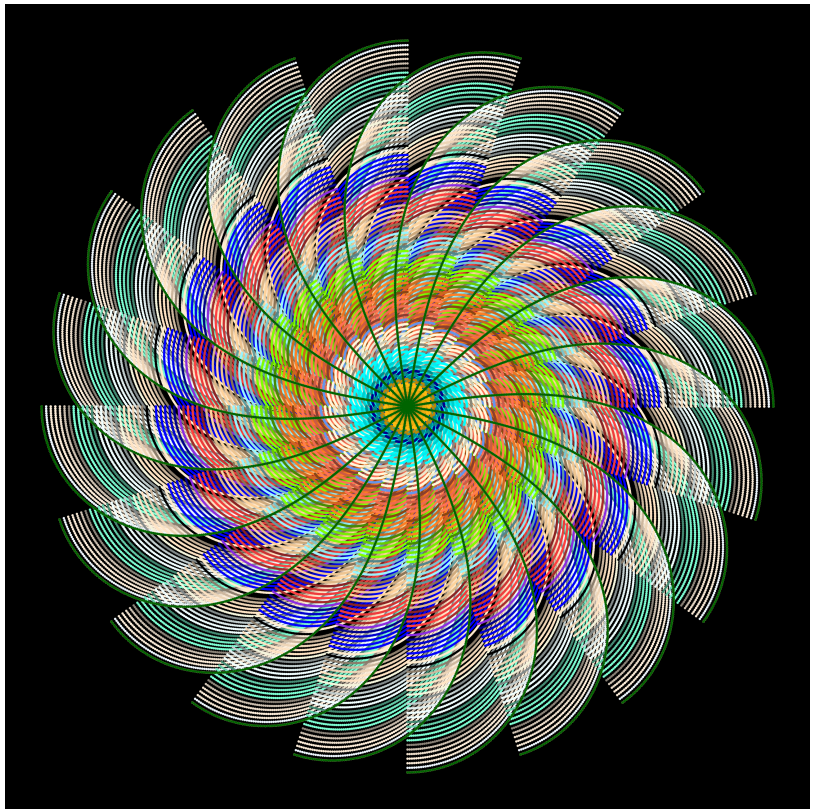




Explorações I

- Homotetias direção crescente.
- Homotetias direção decrescente.

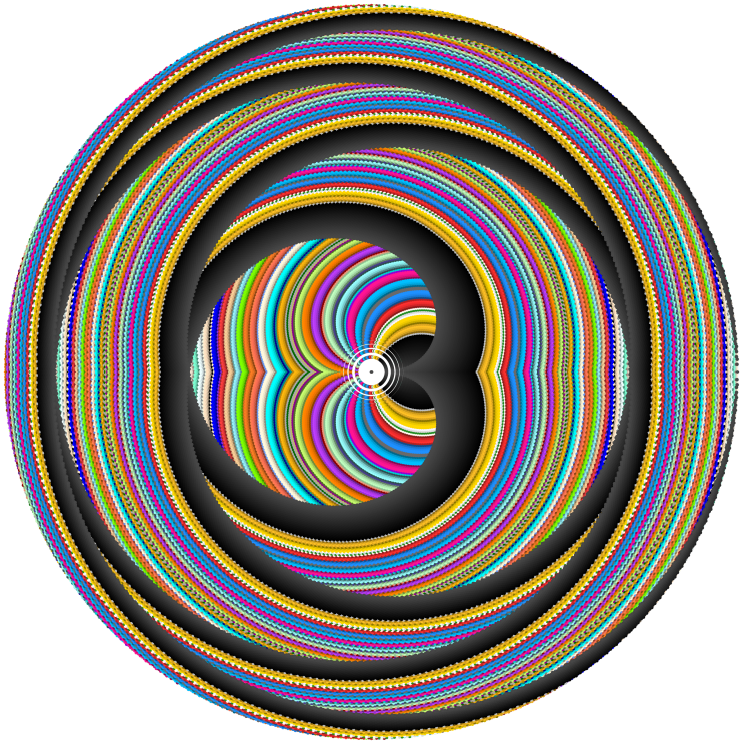




Explorações II

```
a=0.325
contracao=c(a,a^2,a^3)
for(i in 1:length(rotacao)){
    xt=c(x[1:n]*cos(rotacao[i])-y[1:n]*sin(rotacao[i]))
    yt=c(x[1:n]*sin(rotacao[i])+y[1:n]*cos(rotacao[i]))
    dt=tibble::tibble(xt,yt)
  p=p+geom_point(data=dt, aes(x=xt, y=yt),
    color=colors()[i],size=.15)
for(j in 1:length(contracao)){
  xt1=xt*contracao[j]
  yt1=yt*contracao[j]
  dt1=tibble::tibble(xt1,yt1)
  p=p+geom_point(data=dt1, aes(x=xt1, y=yt1),
    color=cores[i],size=.25)
  }
```

Explorações III



Considerações Finais

- Foco inicial: figuras circulares e simetrias-> foco em rotação e homotetia.
  - Elementos apresentados são mais abrangentes.
- Resultados restritos às curvas planas não excluem outras possibilidades.
- Potencial educacional: geometria, funções, programação.
  - Problemas matemáticos associados: combinatória, probabilidades, estatística, progressões, geometria plana, cálculo, etc.
  - programação: elementos básicos e avançados.

Referências

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Obrigado!

- contato: `jp2@alumni.usp.br`