Coordenadas polares - Parte 1

Ademir Alves Ribeiro

2021

https://youtu.be/ruHL3WGZIjQ

DMAT - UFPR

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Representação de objetos no plano

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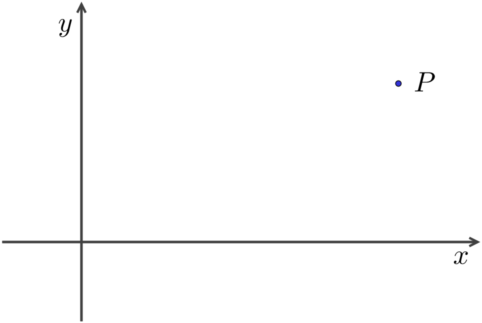
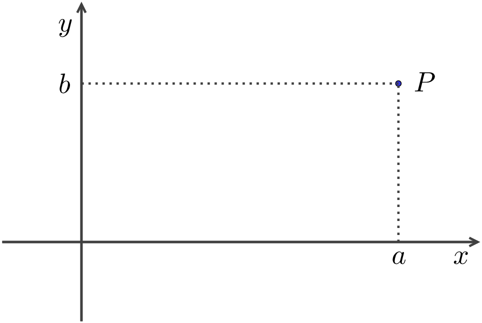
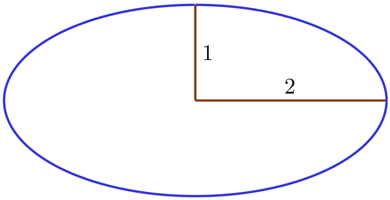


Representação de objetos no plano

- $P = (a, b)$.

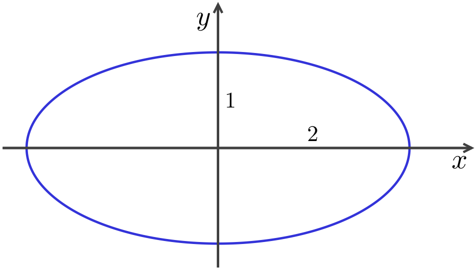


- Elipse $\mathcal{E}$: ?



Representação de objetos no plano

- Elipse $\mathcal{E} : x^2 + 4y^2 - 4 = 0$.



O sistema polar

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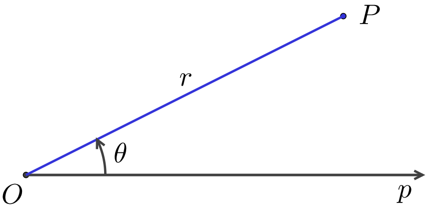

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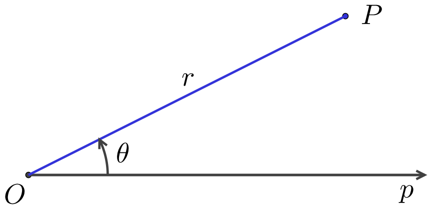
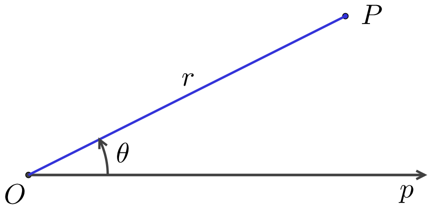
- $P = (r, \theta)$;
- $r \geq 0, \quad \theta \in [0, 2\pi)$;



O sistema polar

- $P = (r, \theta)$;
- $r \geq 0, \quad \theta \in [0, 2\pi)$;
- Pode ser conveniente considerar $\theta \in X$ para outros conjuntos X;



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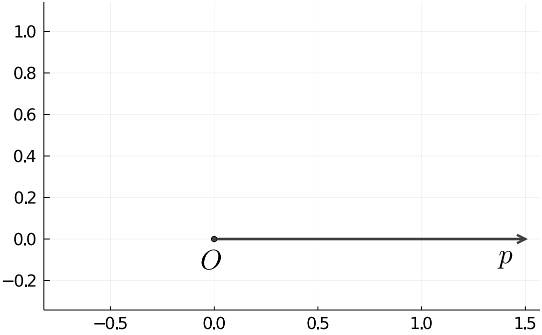
Exercício 1

Considere um sistema polar (O, p).



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Considere um sistema polar (O, p). Para cada θ no conjunto

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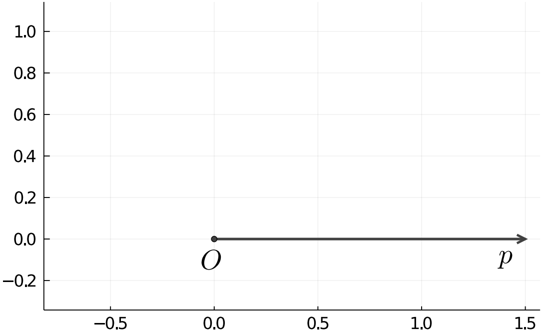
plote o ponto (r, θ), onde $r = \sin\theta$.



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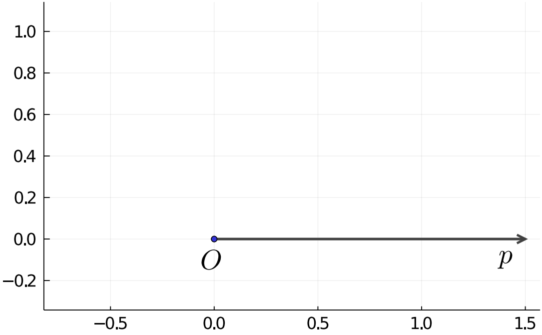

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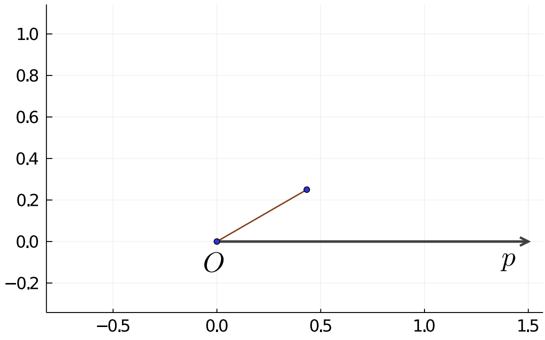

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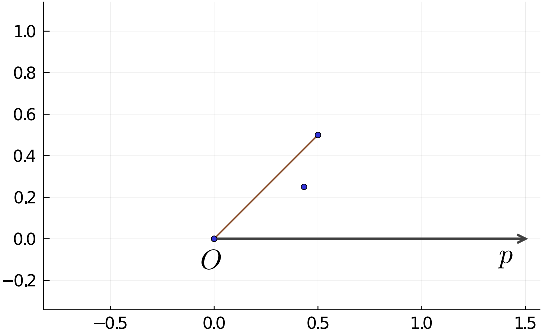

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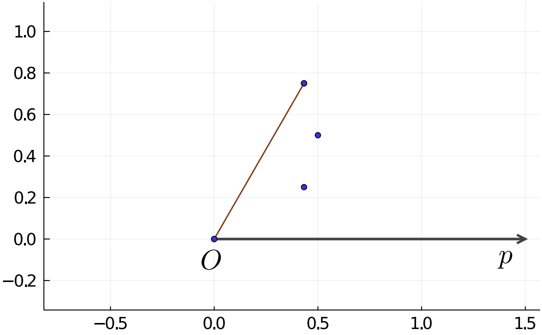

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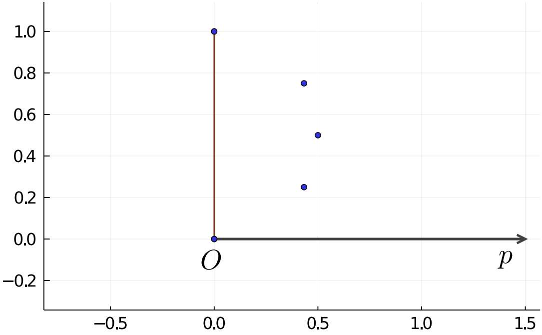

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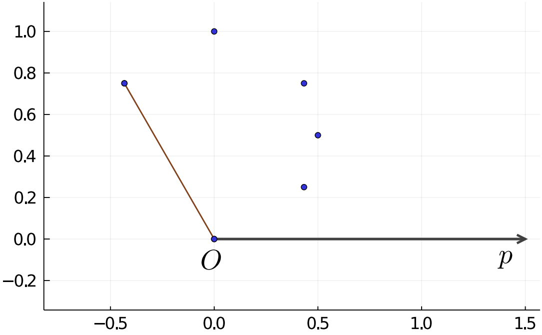

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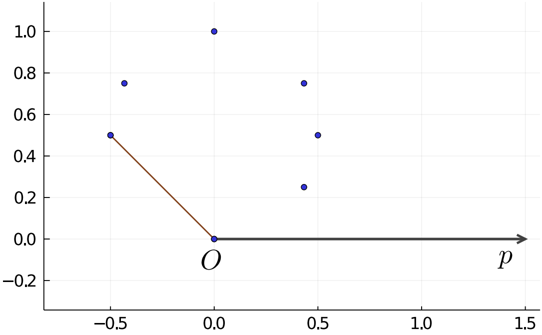

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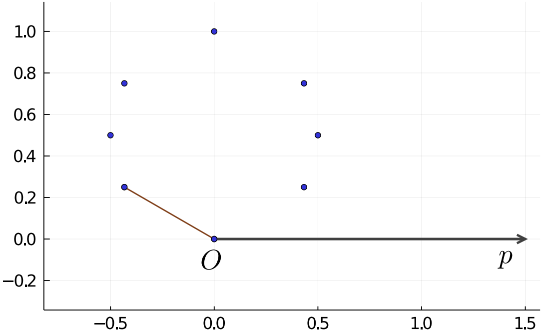

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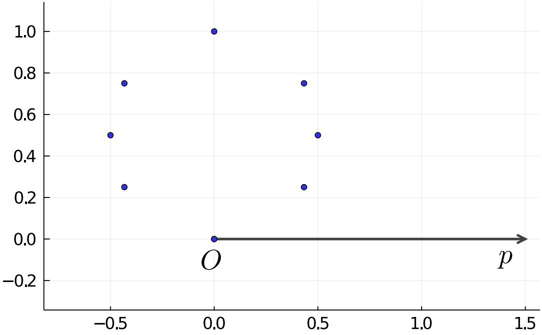

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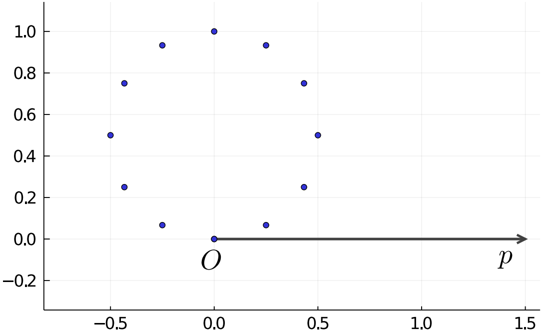

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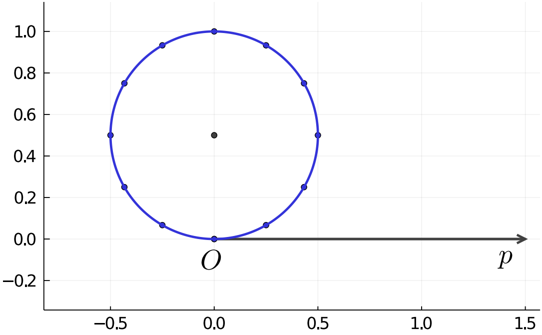

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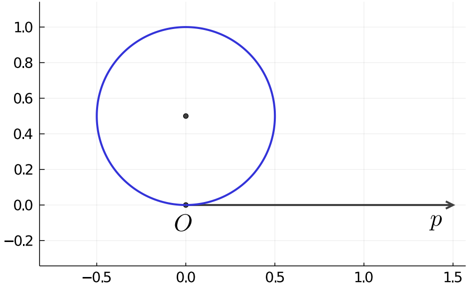

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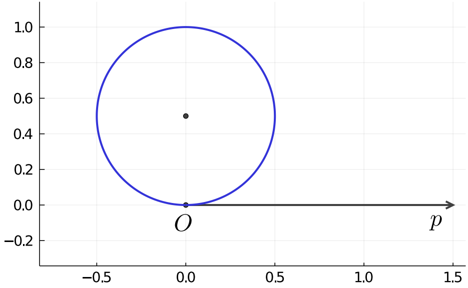

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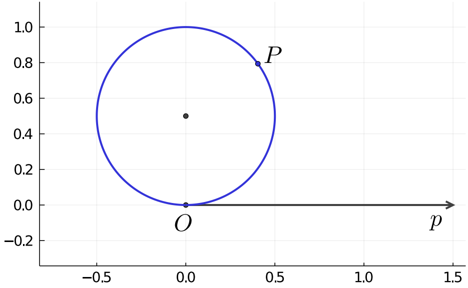

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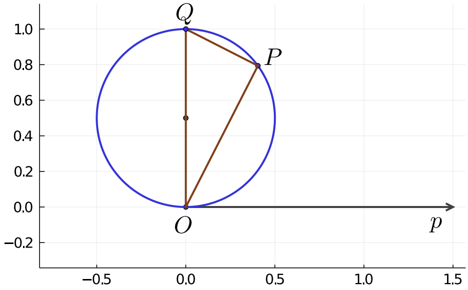

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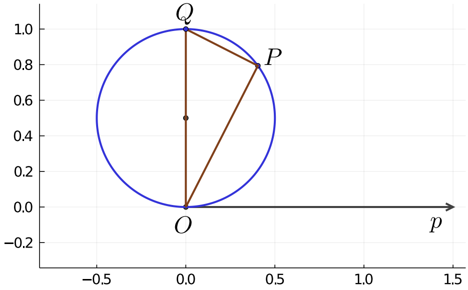

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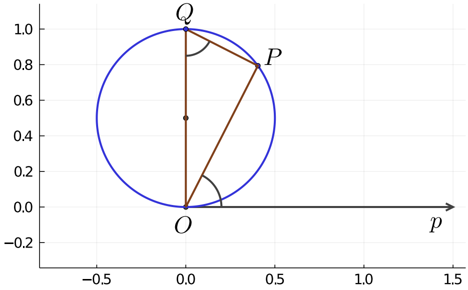

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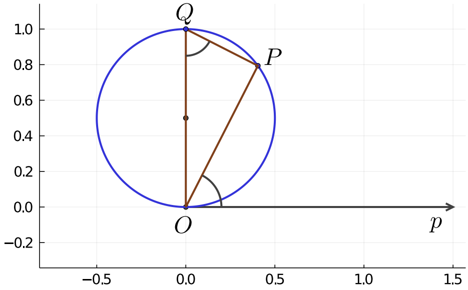

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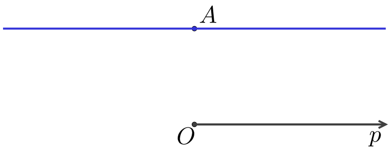
Considere um sistema polar (O, p) e a reta paralela ao eixo polar que passa pelo ponto de coordenadas polares $A = (1, \pi/2)$.



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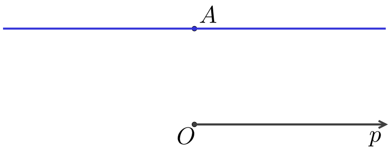

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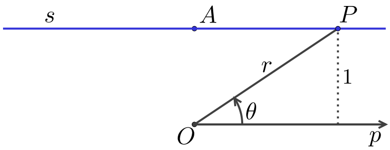

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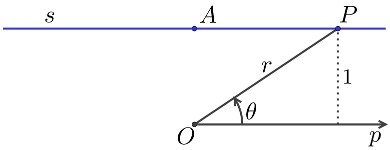

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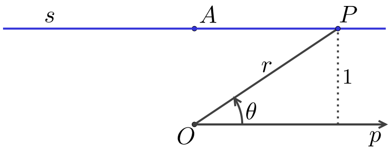

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$$r = e^{\sin\theta} - 2\cos(4\theta) + \sin^5\left(\frac{2\theta - \pi}{24}\right).$$

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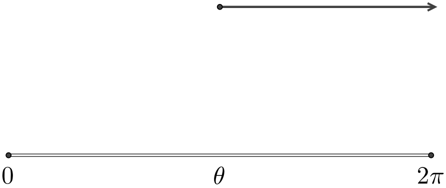

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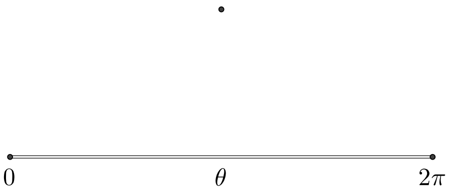

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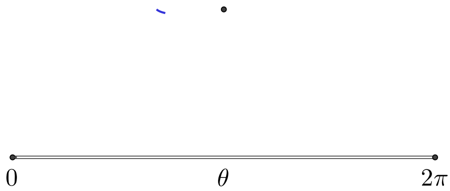

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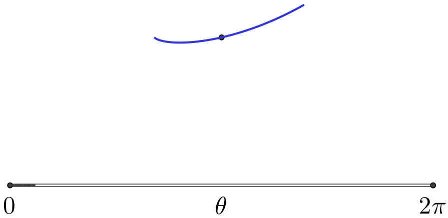

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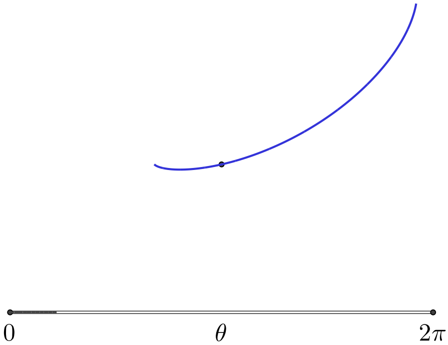

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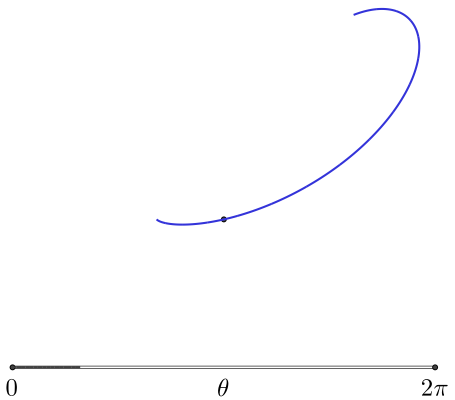

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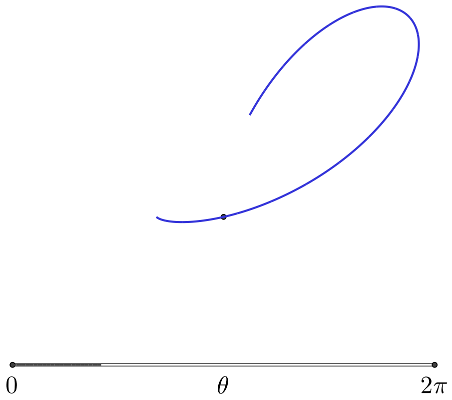

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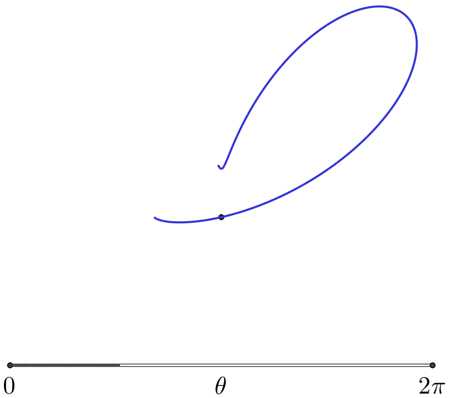

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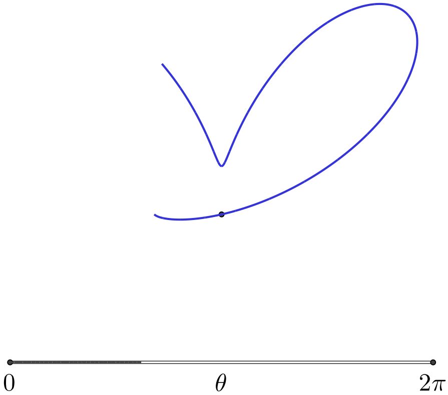

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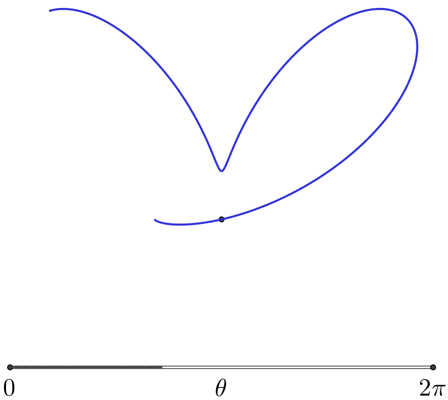

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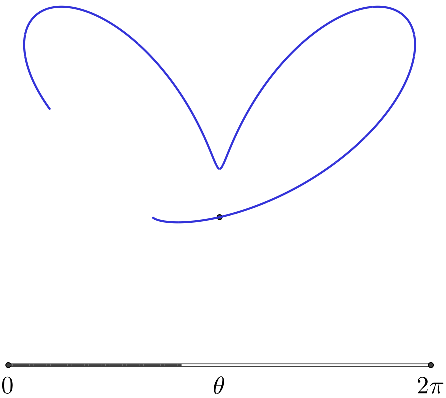

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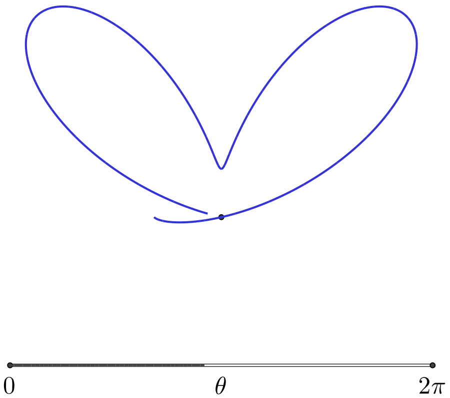

Equações no sistema polar

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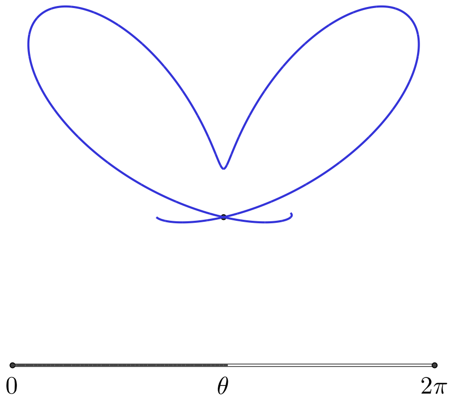

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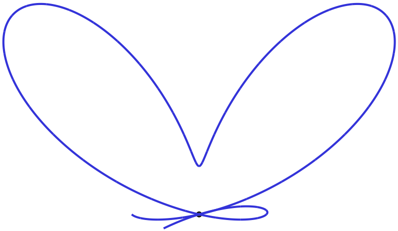

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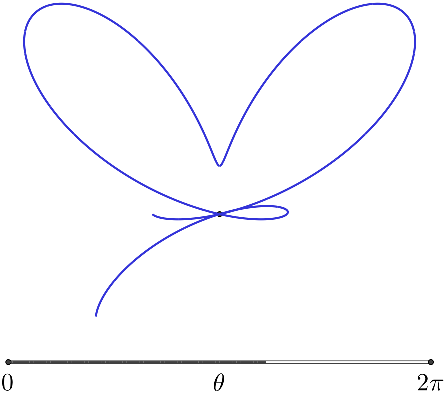

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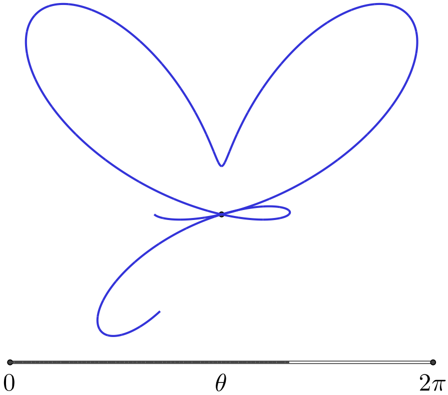

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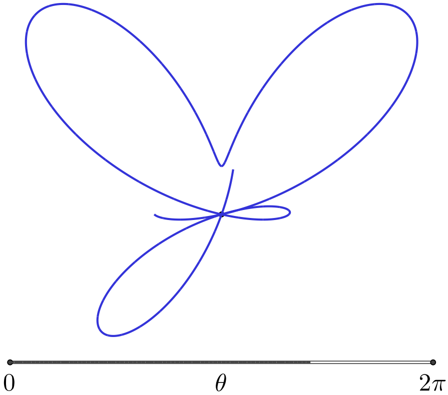

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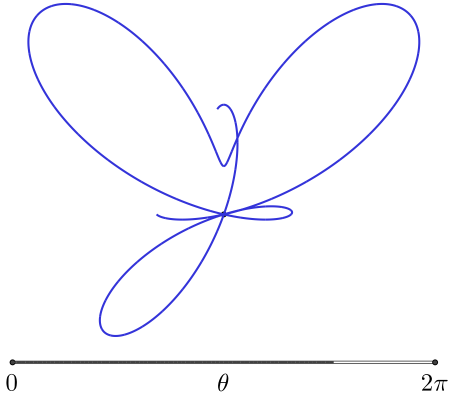

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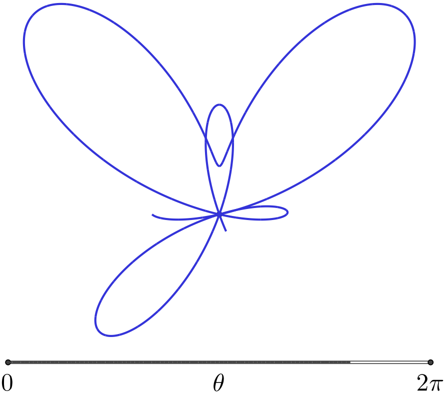

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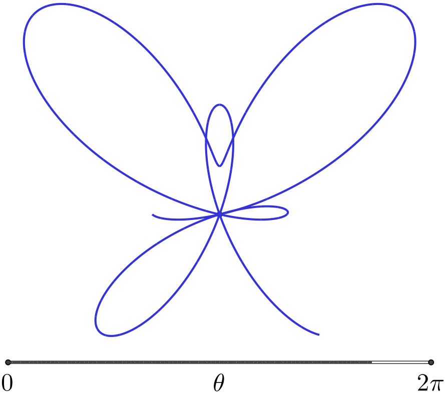

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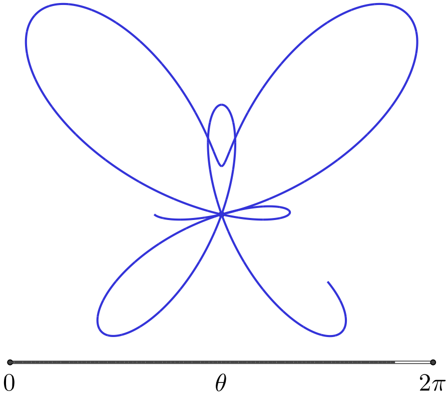

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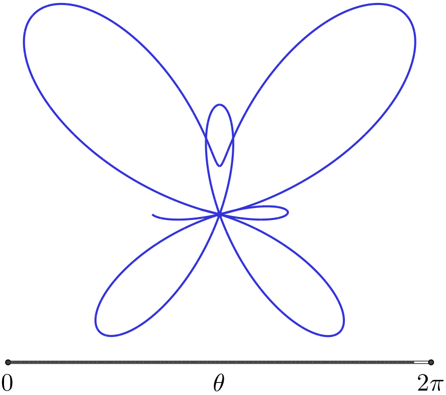

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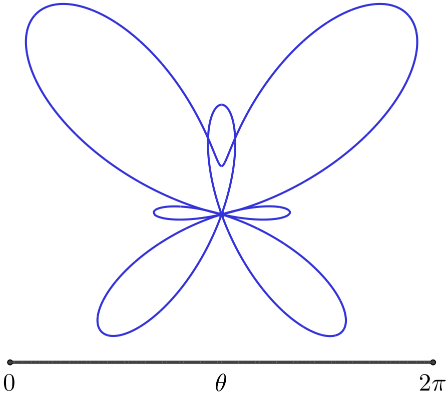

Relação entre as coordenadas nos dois sistemas

- $P = (a, b)$ - coordenadas no sistema cartesiano;
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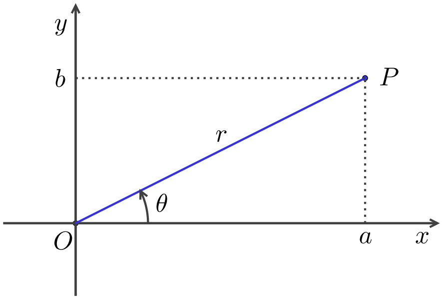

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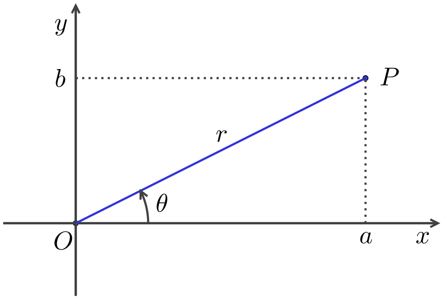

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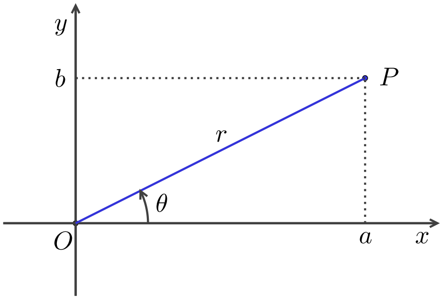

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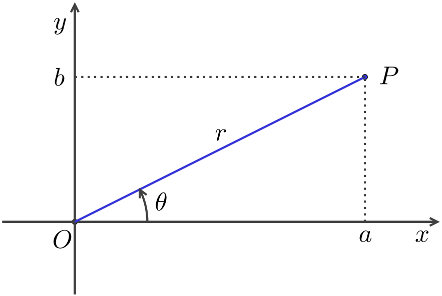
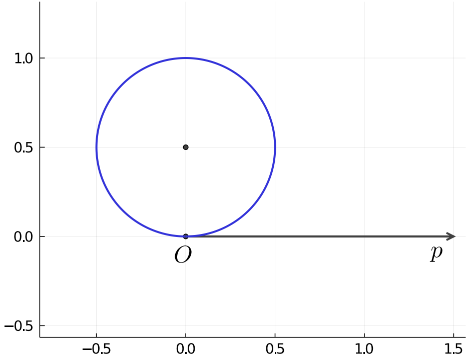


Revisitando o Exercício 2

Exercício 2

Considere um sistema polar (O, p) e a circunferência de raio $1/2$, centrada no ponto de coordenadas polares $(1/2, \pi/2)$. Prove que esta circunferência é dada por $\mathcal{C} = \{(r,\theta) \mid \theta \in [0,\pi),\ r = \sin\theta\}$.



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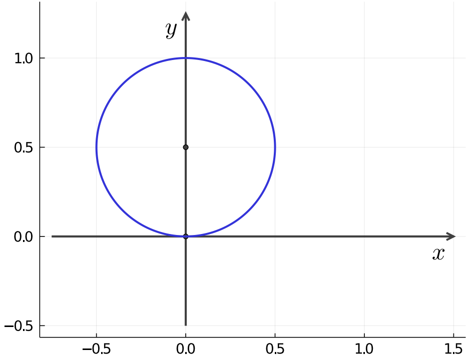

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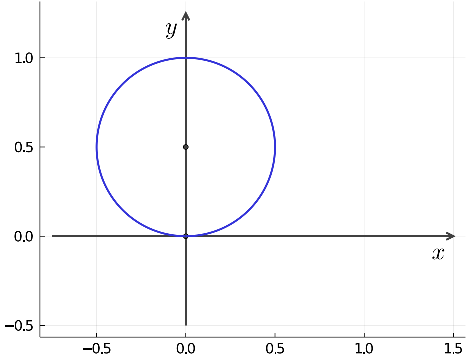

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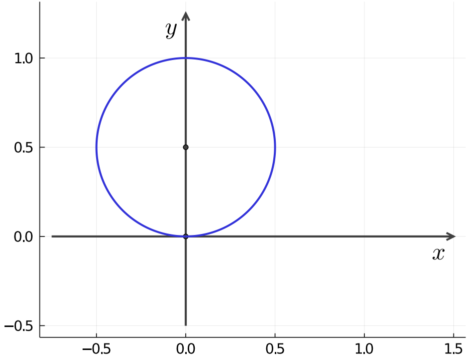

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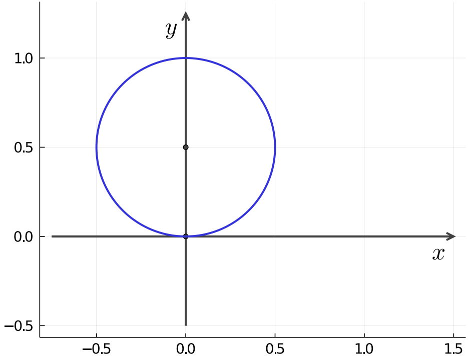

Outros exemplos

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$$(\theta - \pi - \cos r)(\theta - \cos r) = 0.$$

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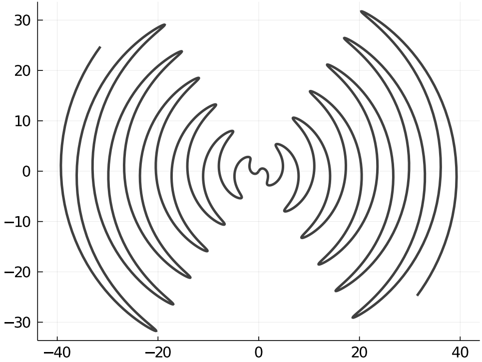

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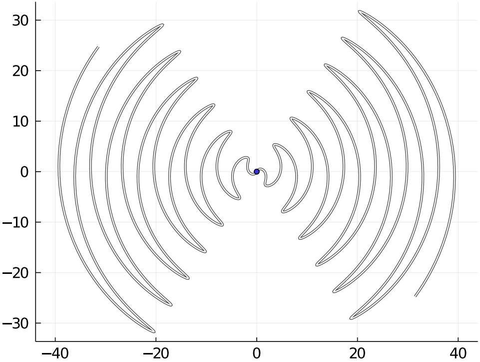

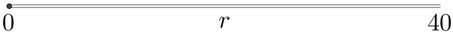

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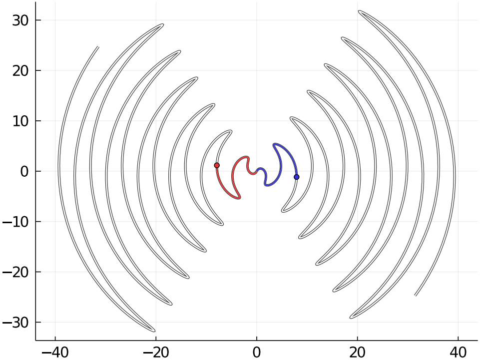

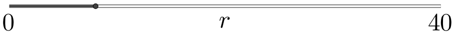

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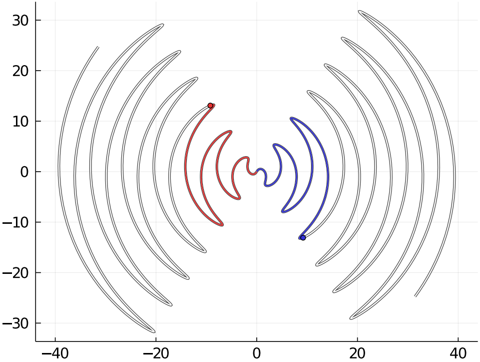

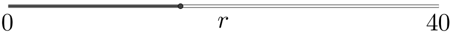

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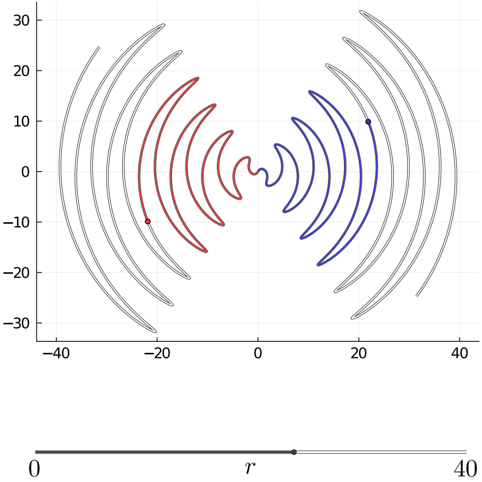

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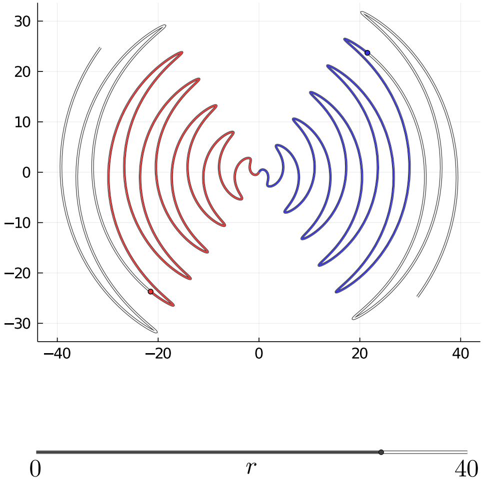

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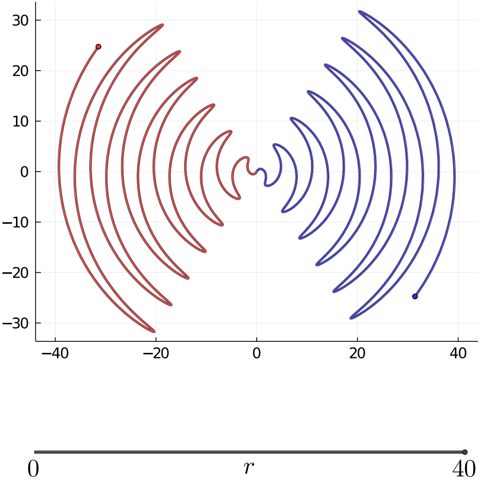

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Exemplo 2

$$r = \sqrt{\cos(2\theta)}.$$

UFPR

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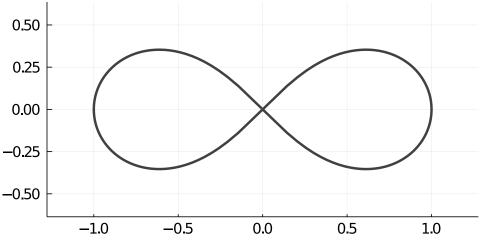

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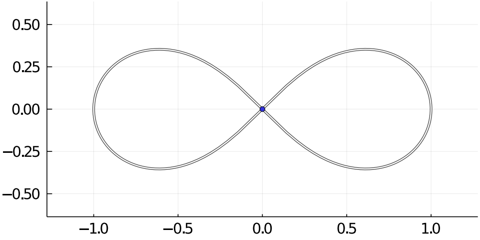

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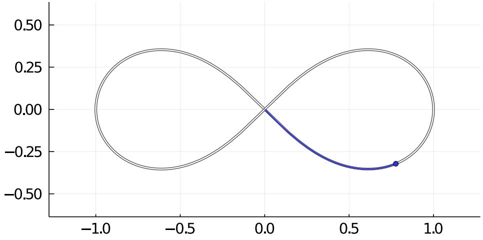

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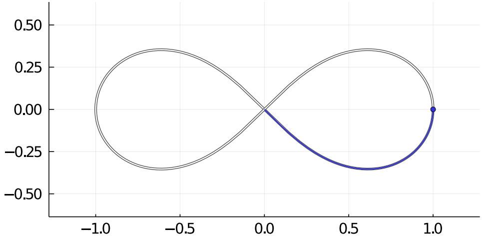

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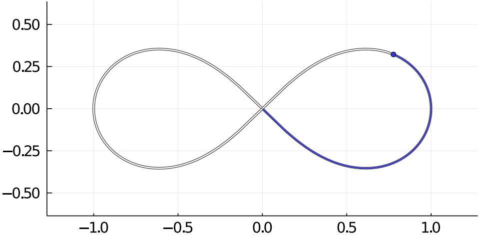

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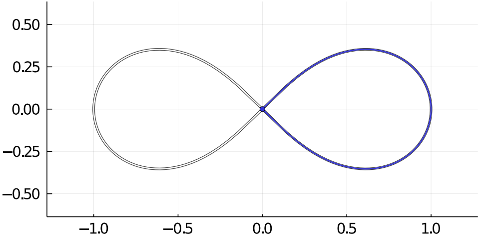

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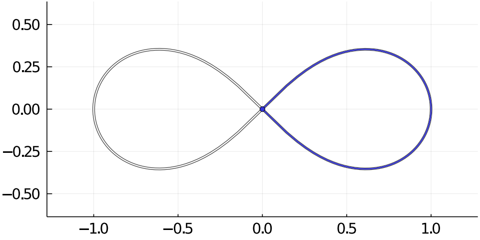

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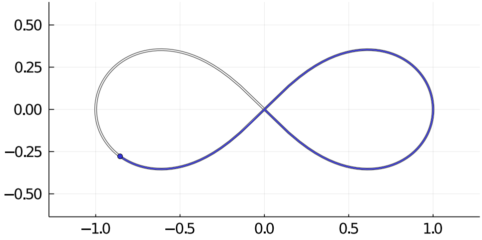

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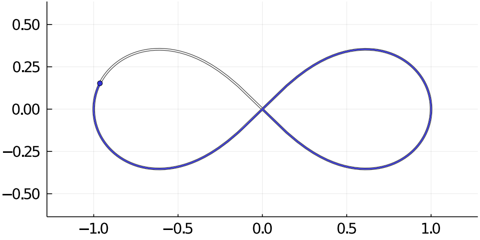

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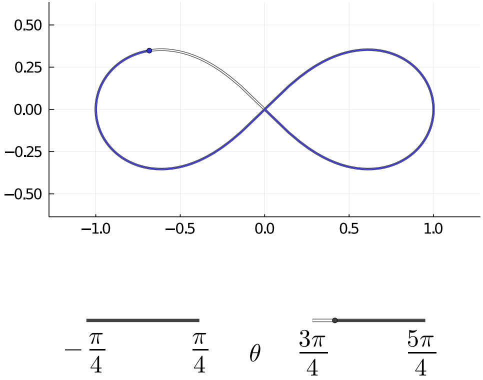

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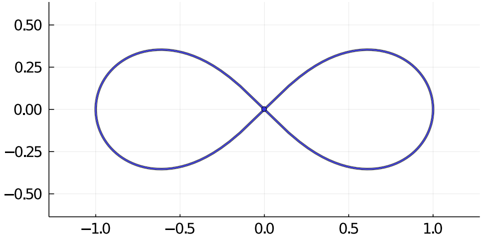

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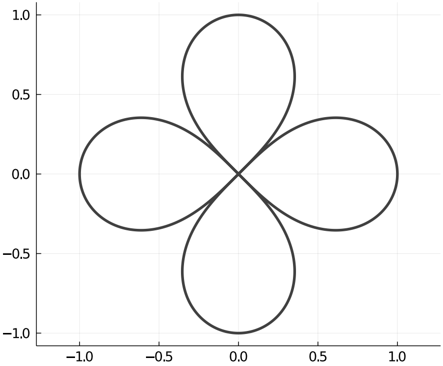

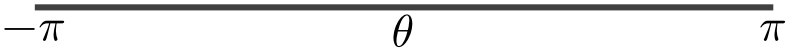

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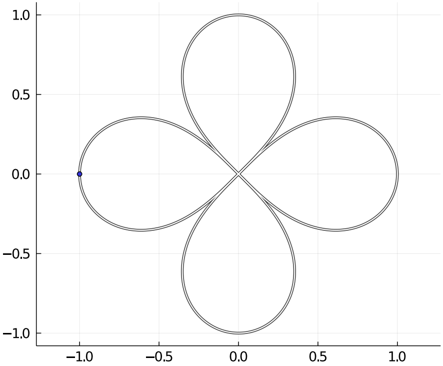

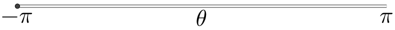

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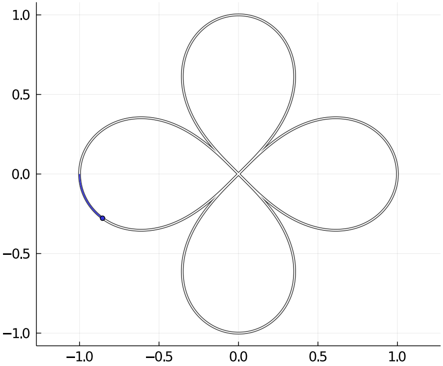

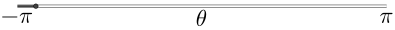

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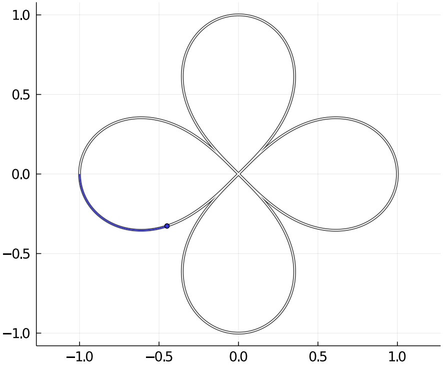

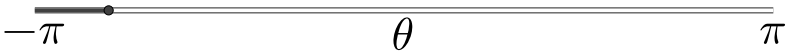

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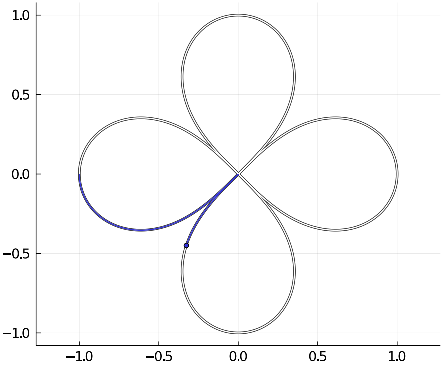

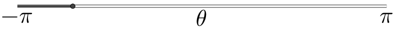

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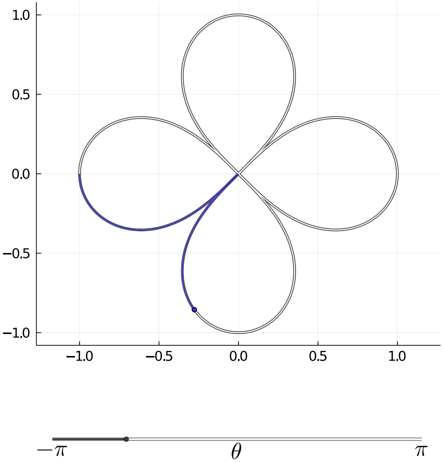

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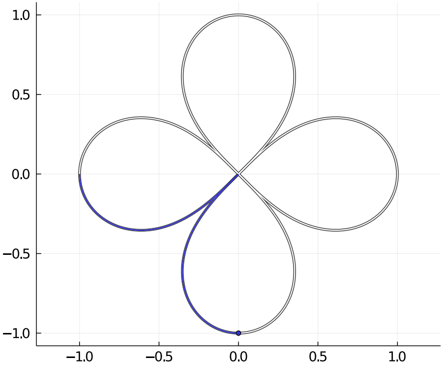

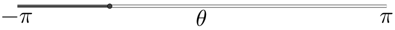

Outros exemplos

Exemplo 3

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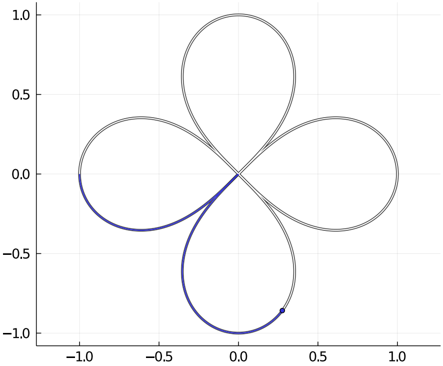

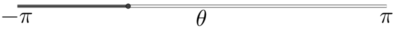

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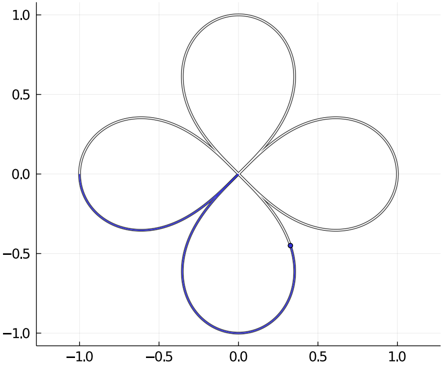

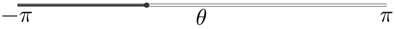

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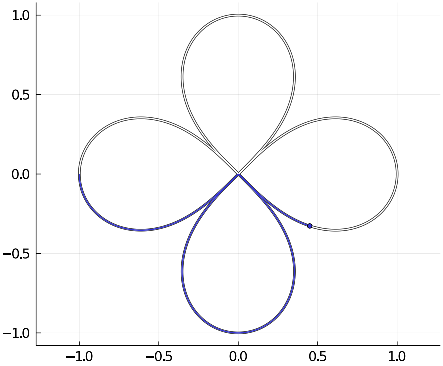

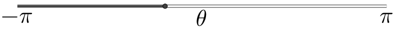

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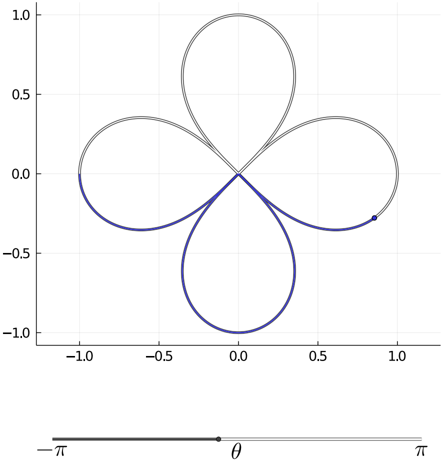

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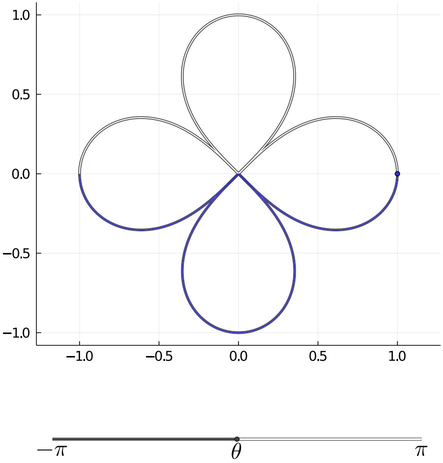

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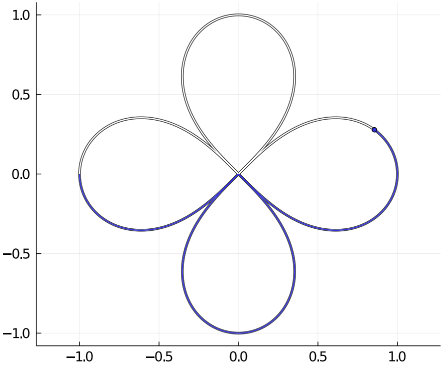

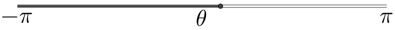

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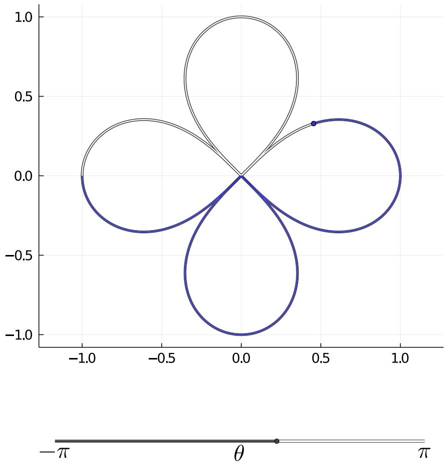

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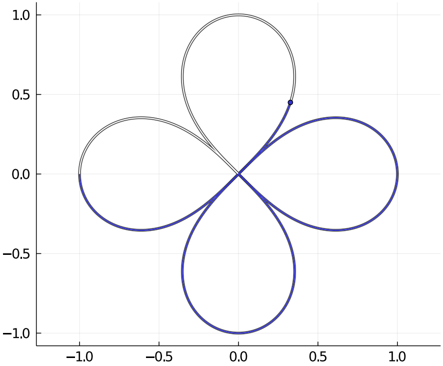

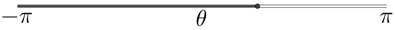

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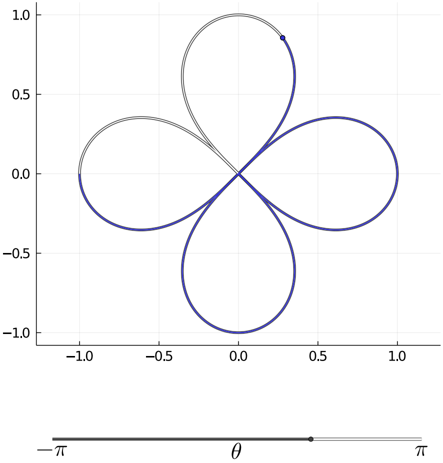

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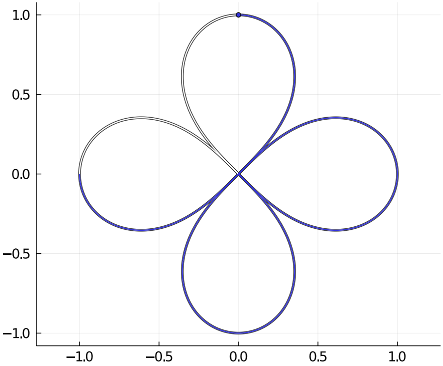

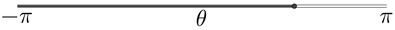

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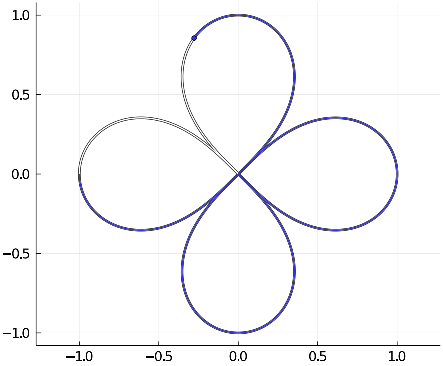

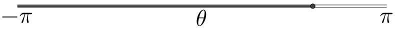

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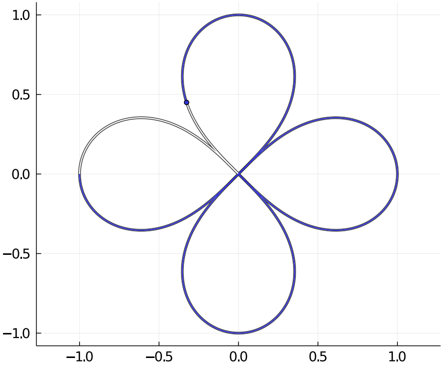

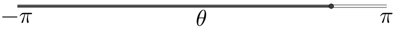

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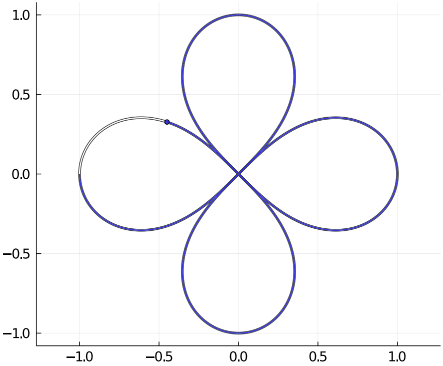

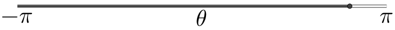

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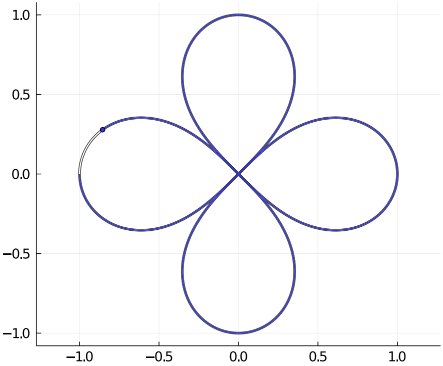

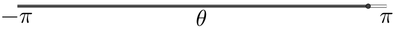

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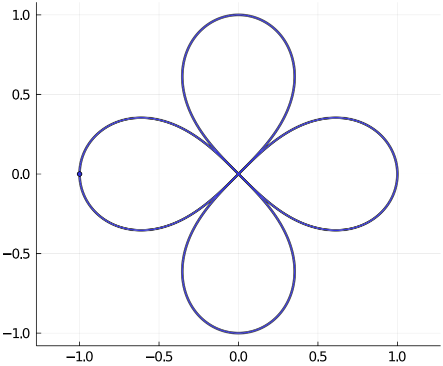

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Outros exemplos

Exemplo 4

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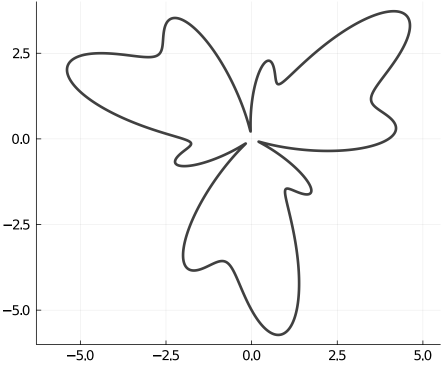

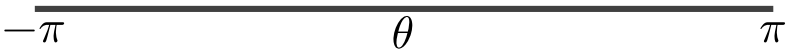

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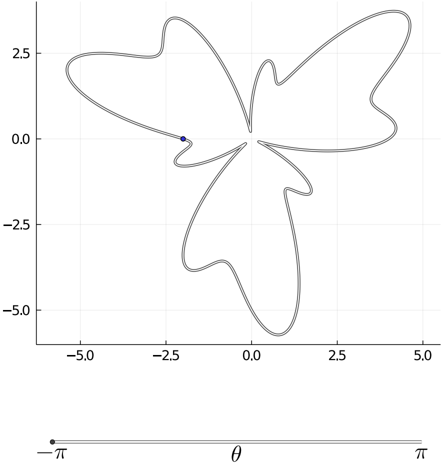

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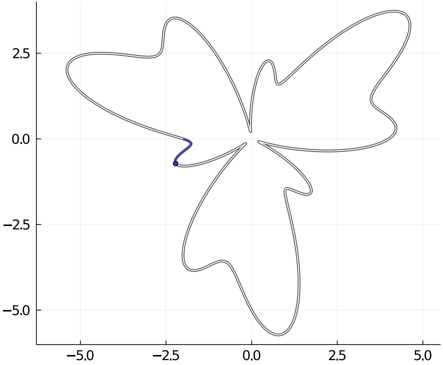

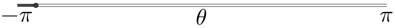

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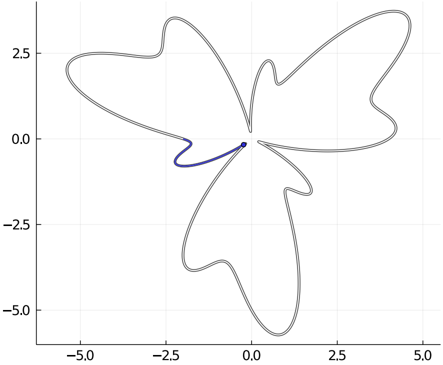

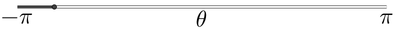

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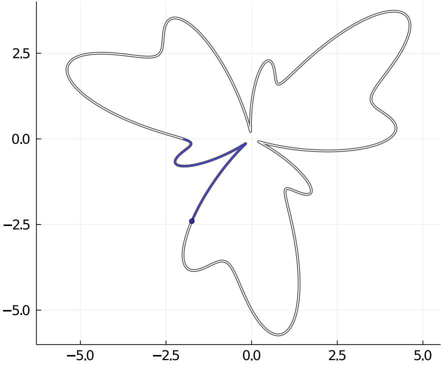

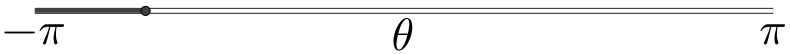

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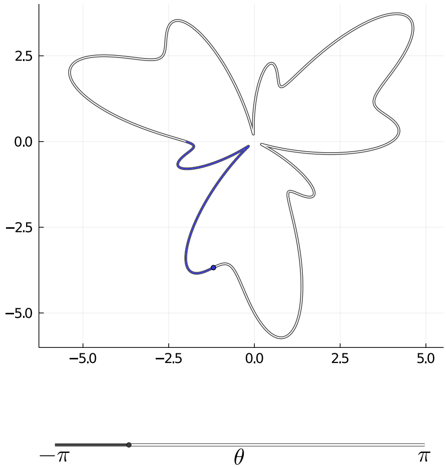

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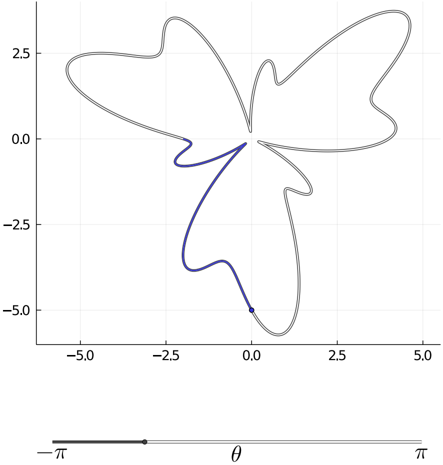

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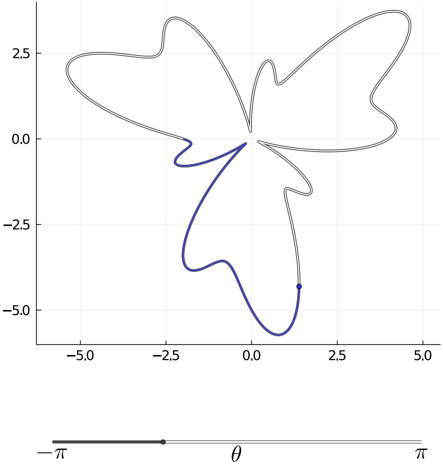

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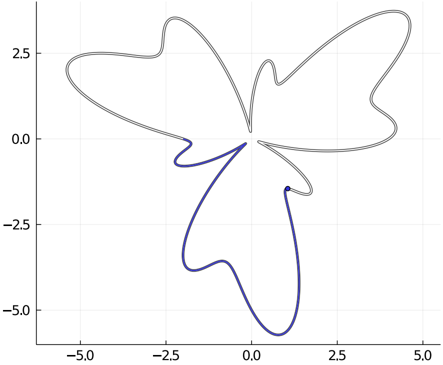

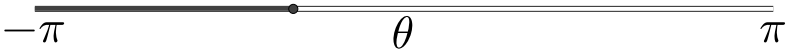

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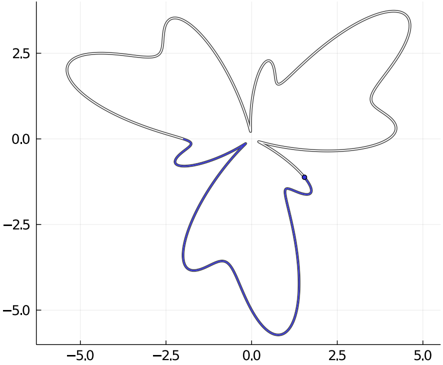

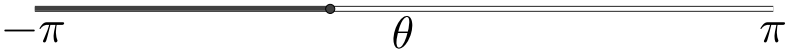

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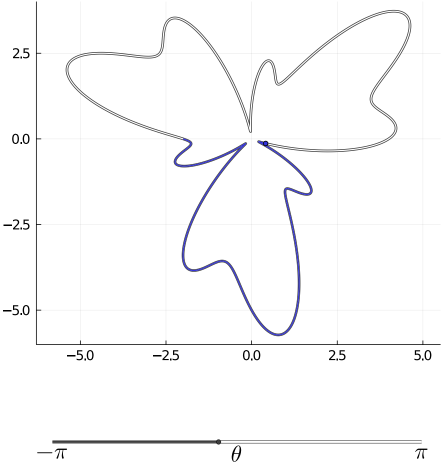

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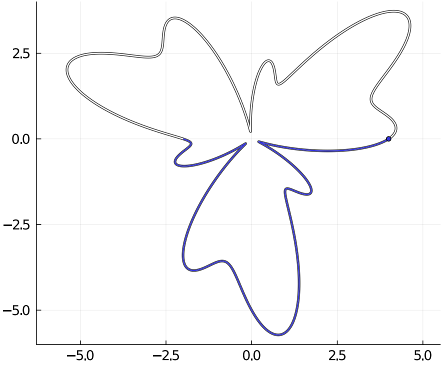

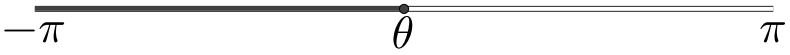

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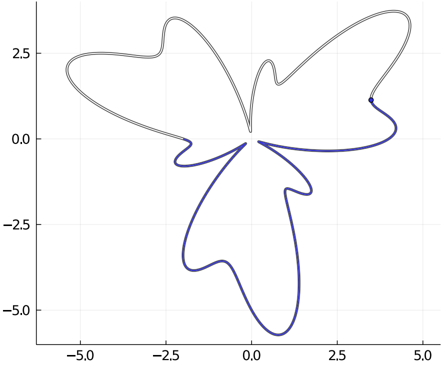

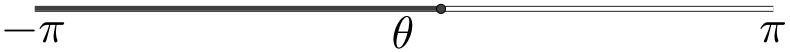

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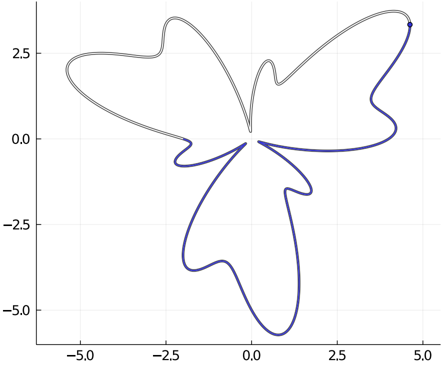

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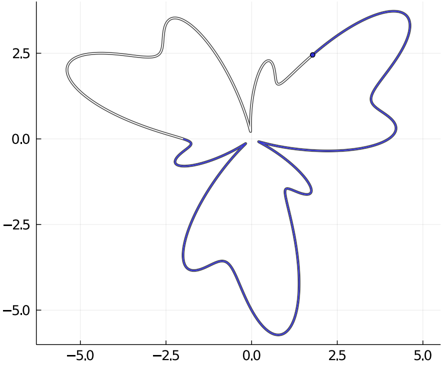

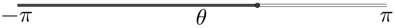

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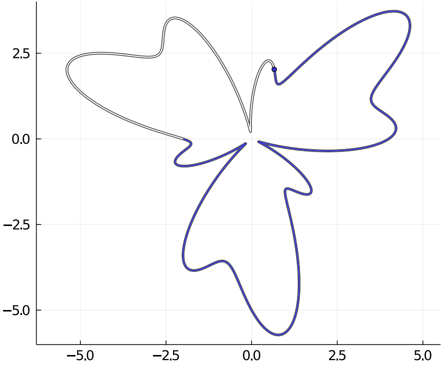

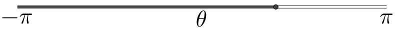

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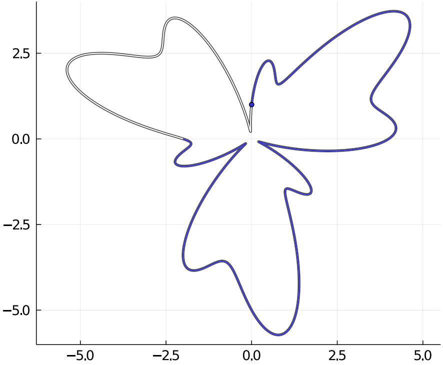

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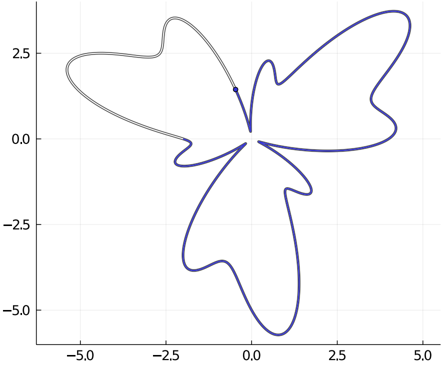

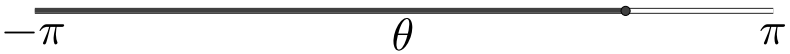

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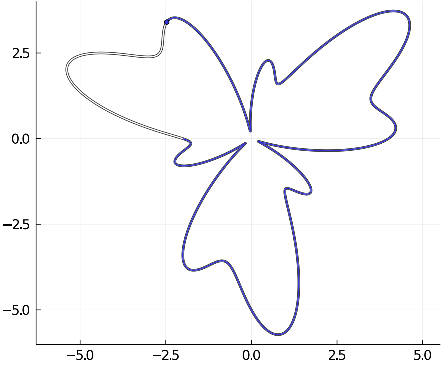

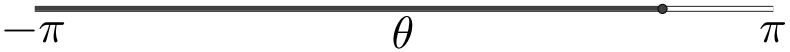

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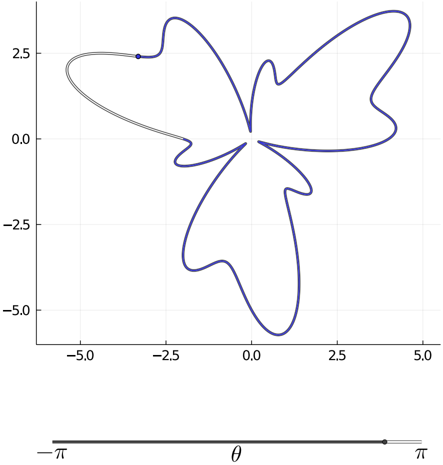

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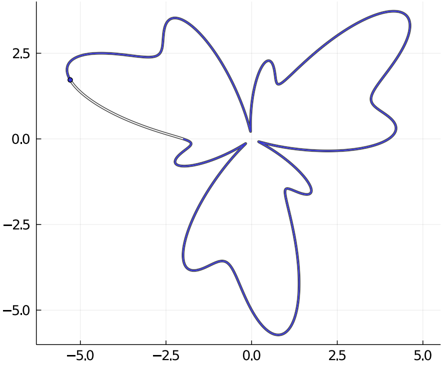

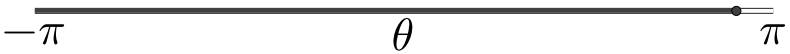

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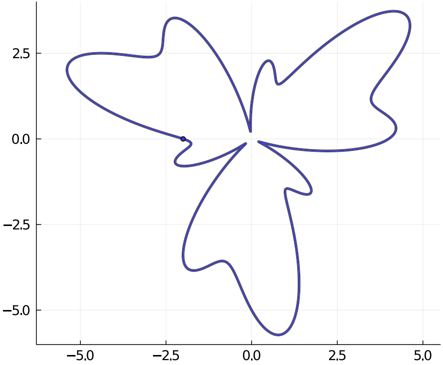

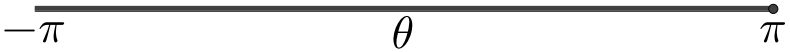

Outros exemplos

Exemplo 5

$$r = \sin^2\left(\frac{12}{5}\theta\right) + \cos^4\left(\frac{12}{5}\theta\right).$$

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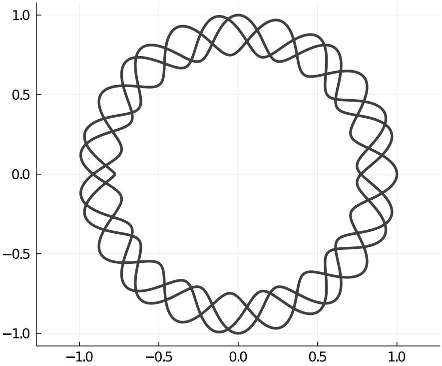
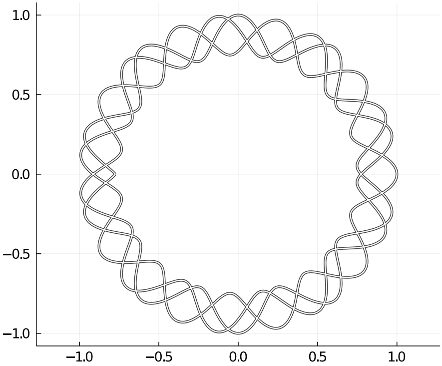


-3π θ 3π

Outros exemplos

Exemplo 5

$$r = \sin^2\left(\frac{12}{5}\theta\right) + \cos^4\left(\frac{12}{5}\theta\right).$$



-3π $\qquad \theta \qquad$ 3π

Exemplo 5

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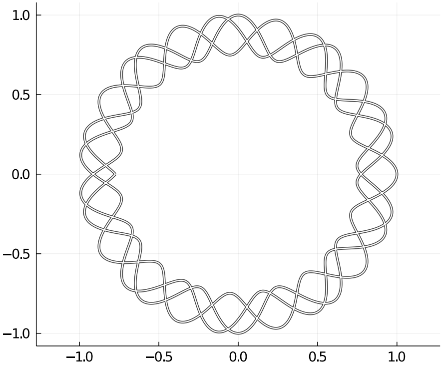

-3π θ 3π

Outros exemplos

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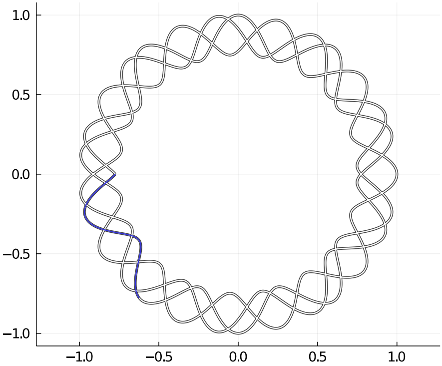

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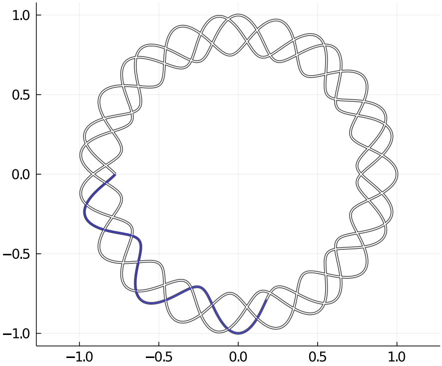

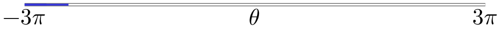

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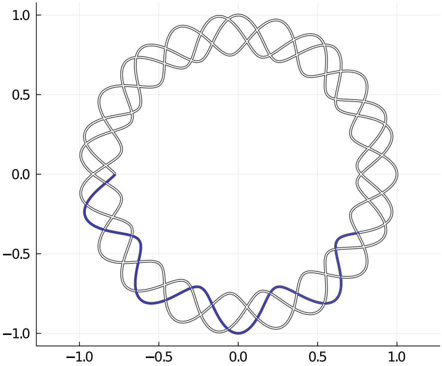

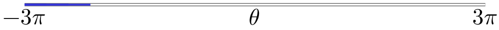

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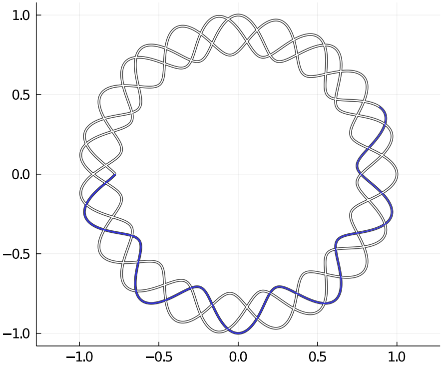

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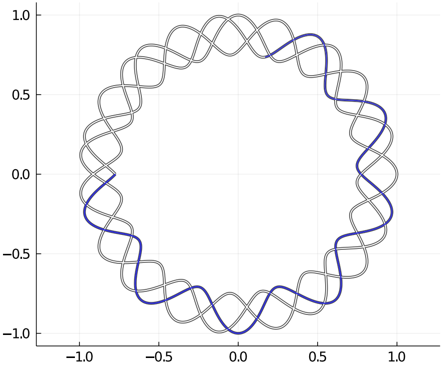

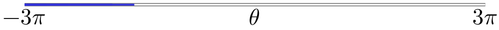

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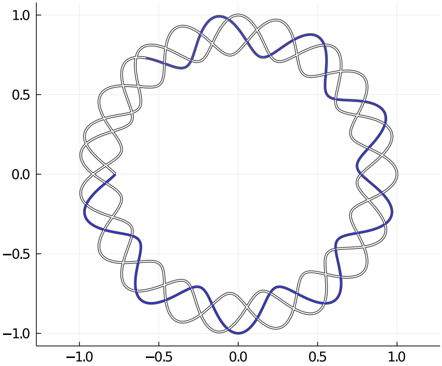

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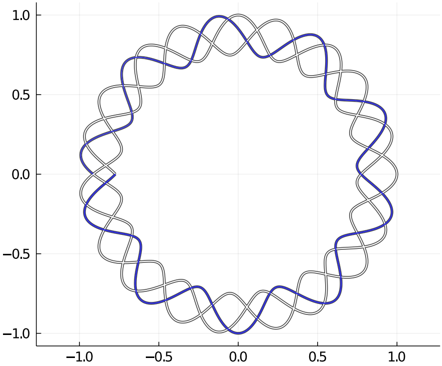

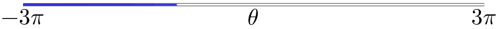

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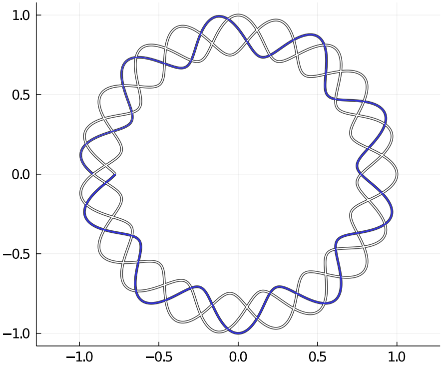

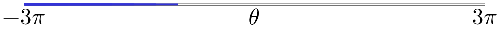

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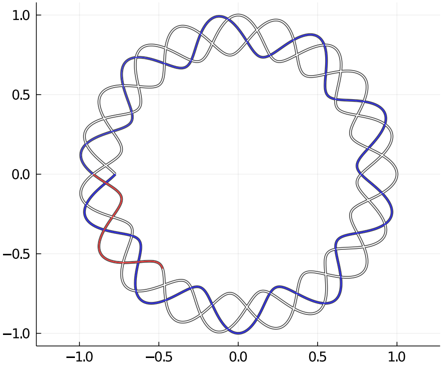

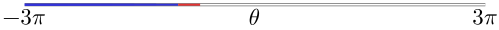

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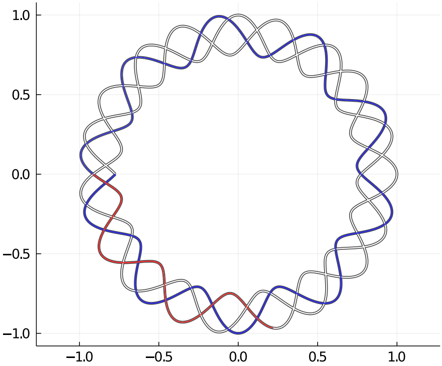

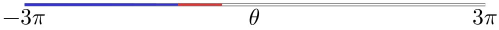

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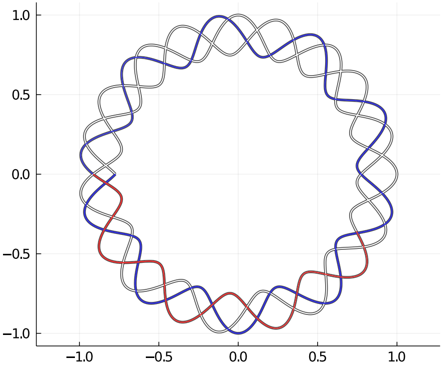

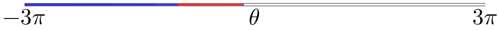

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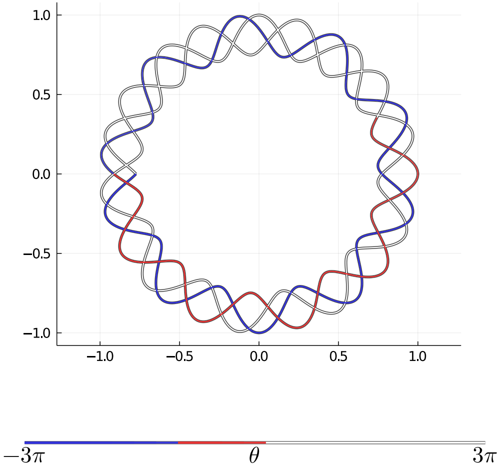

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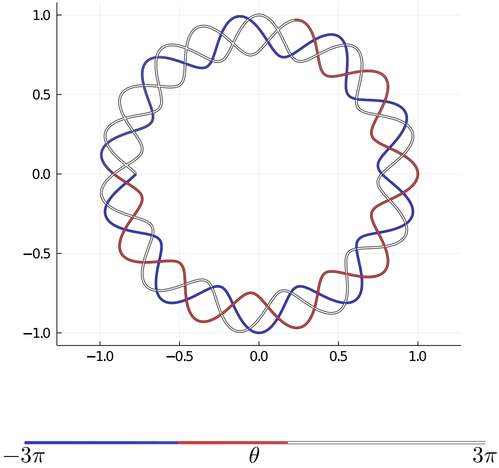

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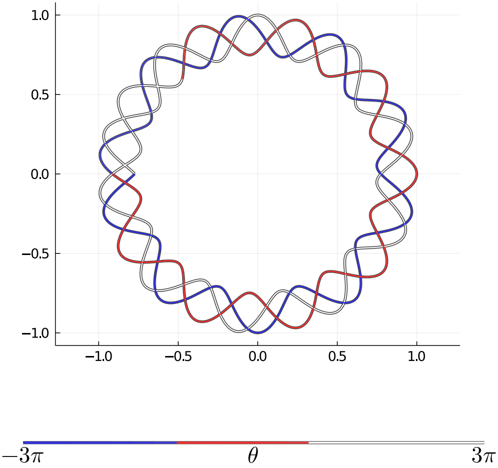

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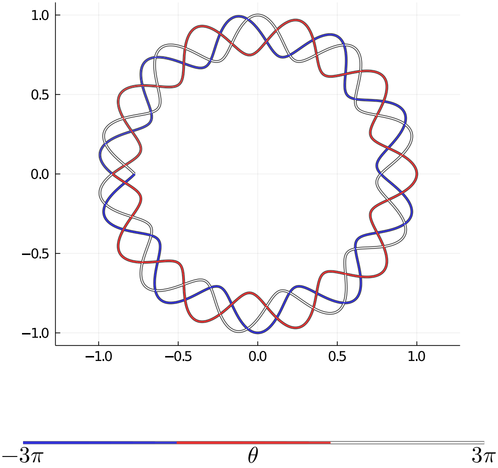

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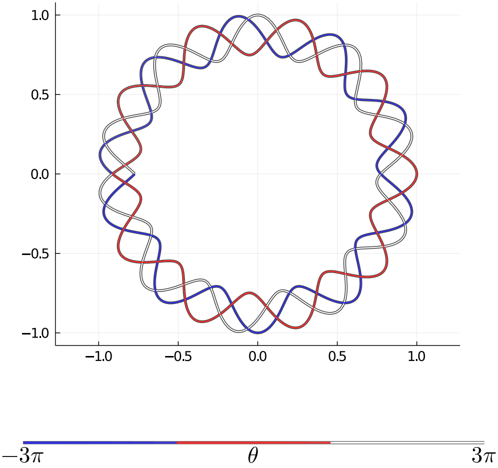

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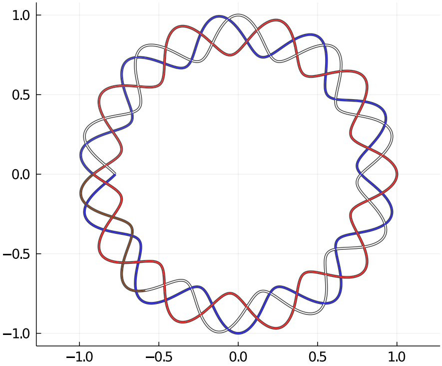

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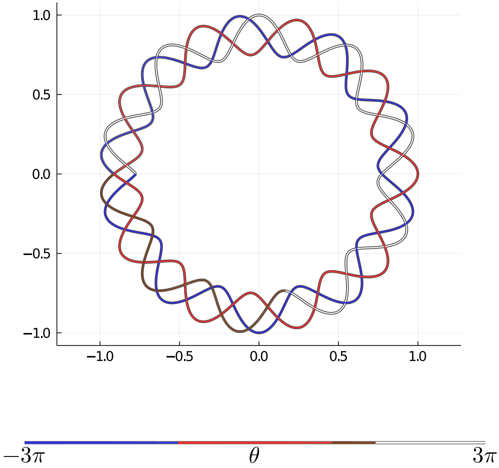

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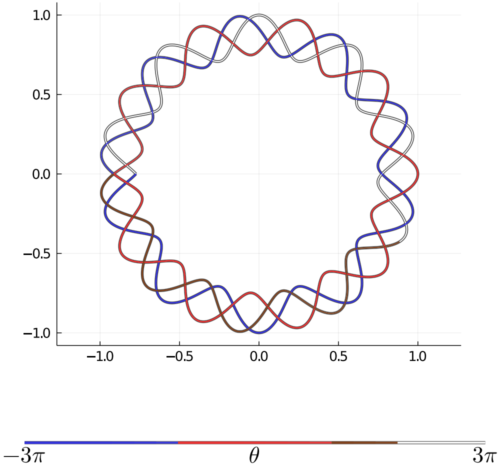

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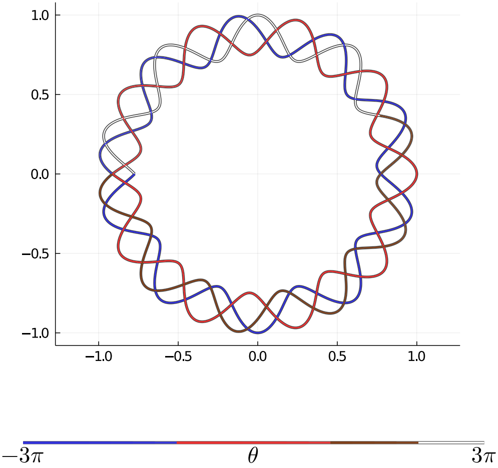

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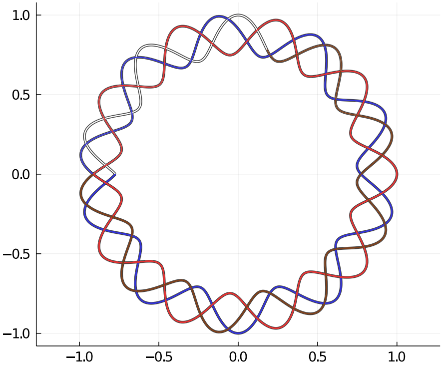

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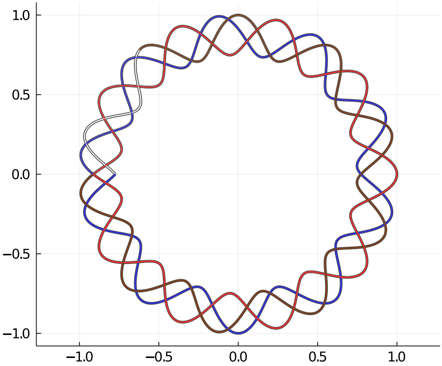

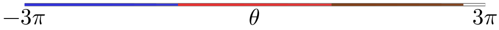

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