

## Tema 2.

Utilizarea bibliotecii OpenGL pentru trasarea curbelor plane.

1. In exemplul [urmator](#) am utilizat primitiva grafica OpenGL de trasare a liniilor pentru a trasa

1. graficul functiei:  $|\sin x| \cdot e^{-\sin x}$ ,  $x \in [0, 8\pi]$  si
2. graficul concoidei lui Nicomede (concoida drepte):

$$x = a \pm b \cdot \cos t, y = a \cdot \tan t \pm b \cdot \sin t, t \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right).$$

2. Integrati in exemplul [precedent](#) functii C care realizeaza:

1. afisarea [functiei](#):  $f(x) = \begin{cases} 1, & x = 0 \\ \frac{d(x)}{x}, & 0 < x \leq 100 \end{cases}$ , unde  $d(x)$  este distanta de la  $x$  la cel mai apropiat intreg.
2. afisarea urmatoarelor curbe date prin ecuatii parametrice (peste tot, mai jos, valorile diversilor parametri, notati  $a$ ,  $b$ , etc. se gasesc in interiorul imaginilor):
  1. [melcul lui Pascal](#) (concoida cercului):

$$x = 2 \cdot (a \cdot \cos t + b) \cdot \cos t, y = 2 \cdot (a \cdot \cos t + b) \cdot \sin t, t \in (-\pi, \pi).$$

2. [trisectoarea lui Longchamps](#):

$$x = \frac{a}{4 \cdot \cos^2 t - 3}, y = \frac{a \cdot \tan t}{4 \cdot \cos^2 t - 3}, t \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \setminus \left\{\pm \frac{\pi}{6}\right\}.$$

3. [cicloida](#):  $x = a \cdot t - b \cdot \sin t, y = a - b \cdot \cos t, t \in \mathbb{R}$

4. [epicicloida](#):

$$x = (R + r) \cdot \cos\left(\frac{r}{R} \cdot t\right) - r \cdot \cos\left(t + \frac{r}{R} \cdot t\right), \\ y = (R + r) \cdot \sin\left(\frac{r}{R} \cdot t\right) - r \cdot \sin\left(t + \frac{r}{R} \cdot t\right), t \in [0, 2\pi].$$

5. [hipocicloida](#):

$$x = (R - r) \cdot \cos\left(\frac{r}{R} \cdot t\right) - r \cdot \cos\left(t - \frac{r}{R} \cdot t\right), \\ y = (R - r) \cdot \sin\left(\frac{r}{R} \cdot t\right) - r \cdot \sin\left(t - \frac{r}{R} \cdot t\right), t \in [0, 2\pi].$$

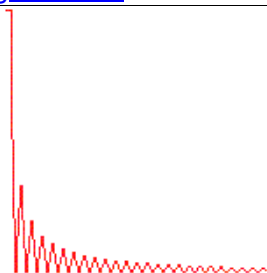
3. Curbe date de ecuatii polare : coordonatele polare sunt  $(r, t)$ , unde  $t \in [a, b]$  si  $r = f(t)$ .

Transformarea in coordonate carteziane a coordonatelor polare  $(r, t)$  este  $x = r \cdot \cos t$  si  $y = r \cdot \sin t$ .

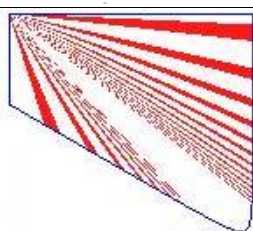
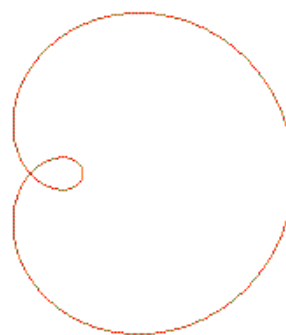
Sa se reprezinte urmatoarele curbe date prin ecuatii polare:

1. lemniscata lui Bernoulli:  $r = \pm a \cdot \sqrt{2 \cdot \cos 2t}$ ,  $t \in \left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$ .

2. spirala logaritmica:  $r = a \cdot e^{1+t}$ ,  $t \in (0, \infty)$ .



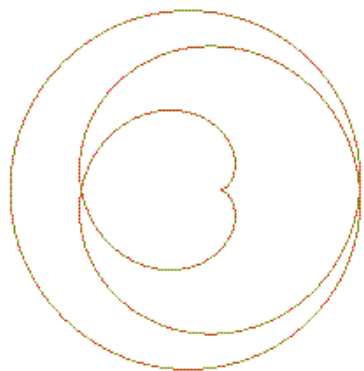
Melcul lui Pascal  
a = 0.3  
b = 0.2



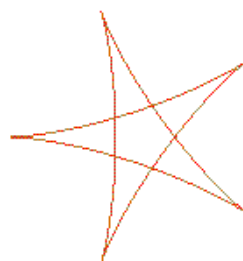
Trisectoarea lui Longchamps  
a = 0.2



Cicloida  
a = 0.1  
b = 0.2



Epicicloida  
 $R = 0.1$   $r = 0.3$



Hipocicloida  
 $R = 0.1$   
 $r = 0.3$



Lemniscata lui Bernoulli  
 $a = 0.4$



Spirala logaritmică  
 $a = 0.02$