

Transforming coordinates

► Polar to Cartesian

$$(r, \theta) \longrightarrow (x, y)$$

$$x = r \cos \theta \quad y = r \sin \theta$$

► Cartesian to Polar

$$(x, y) \longrightarrow (r, \theta)$$

$$r = \sqrt{x^2 + y^2} \quad \theta = \tan^{-1} \left(\frac{y}{x} \right) + k\pi \quad k \in \mathbb{Z}$$

Drawing a parametric curve

- ▶ Calculate the derivatives
- ▶ Look for zeros
- ▶ Calculate the values of well chosen points
- ▶ Interval of the parameter

Some curves: typical expressions

- ▶ Circle

$$x(t) = R \cos t, \quad y(t) = R \sin t \quad r(t) = R, \quad \theta(t) = t$$

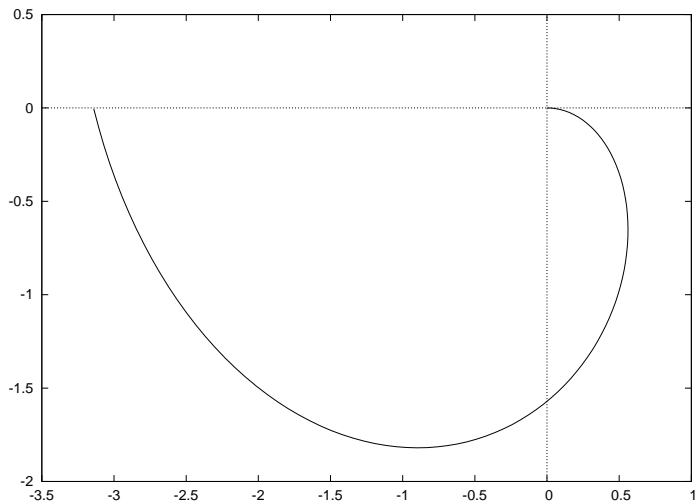
- ▶ Ellipse

$$x(t) = a \cos t, \quad y(t) = b \sin t$$

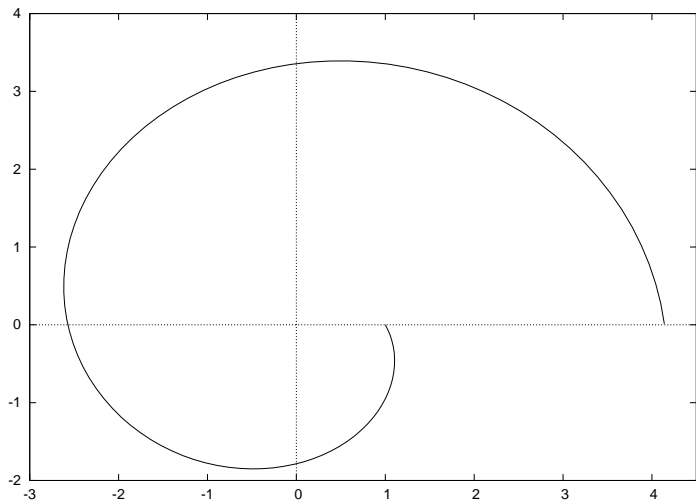
- ▶ Spiral

$$x(t) = t \cos t, \quad y(t) = t \sin t \quad r(t) = t, \quad \theta(t) = t$$

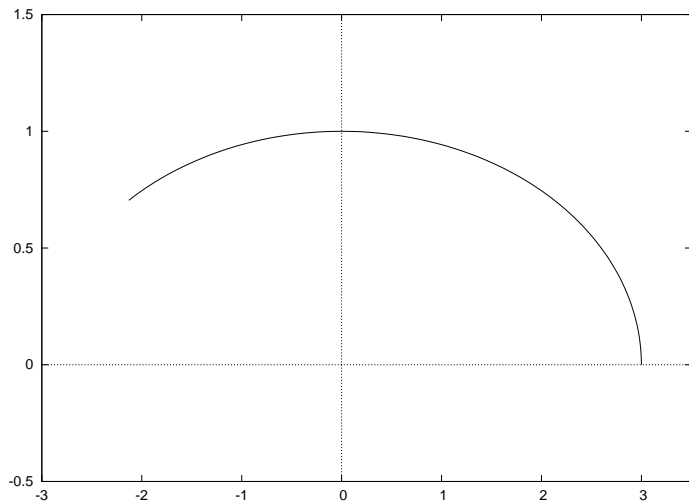
Question 1



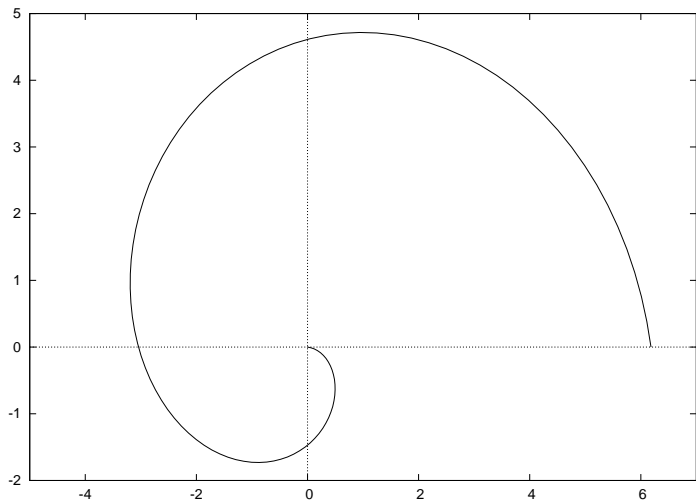
Question 2



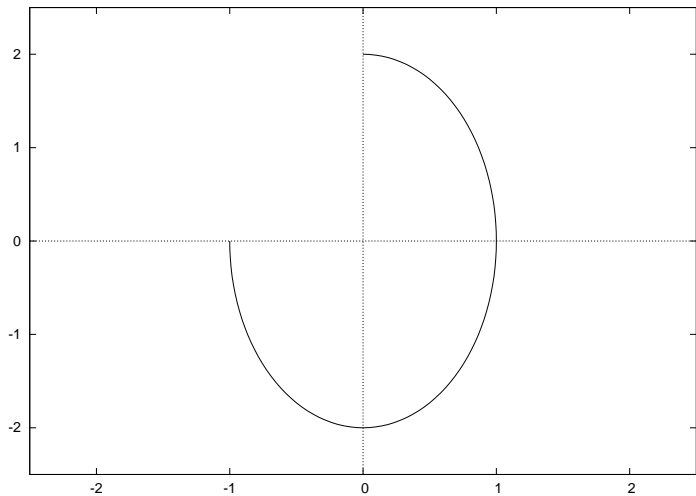
Question 3(1)



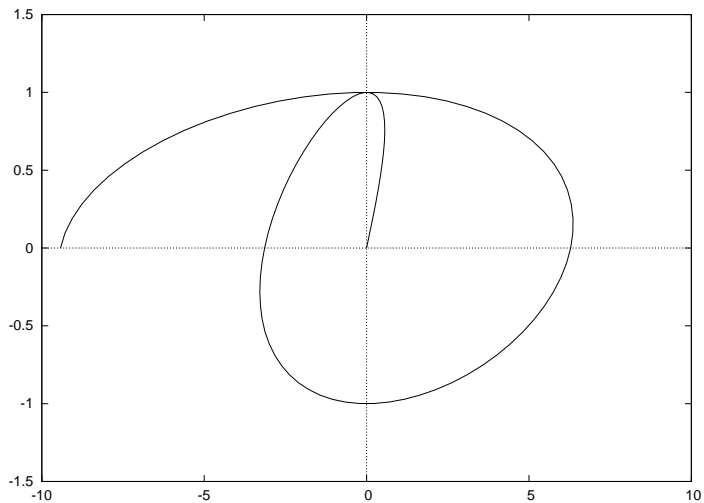
Question 3(2)



Question 4



Question 5(1)



Question 5(2)

