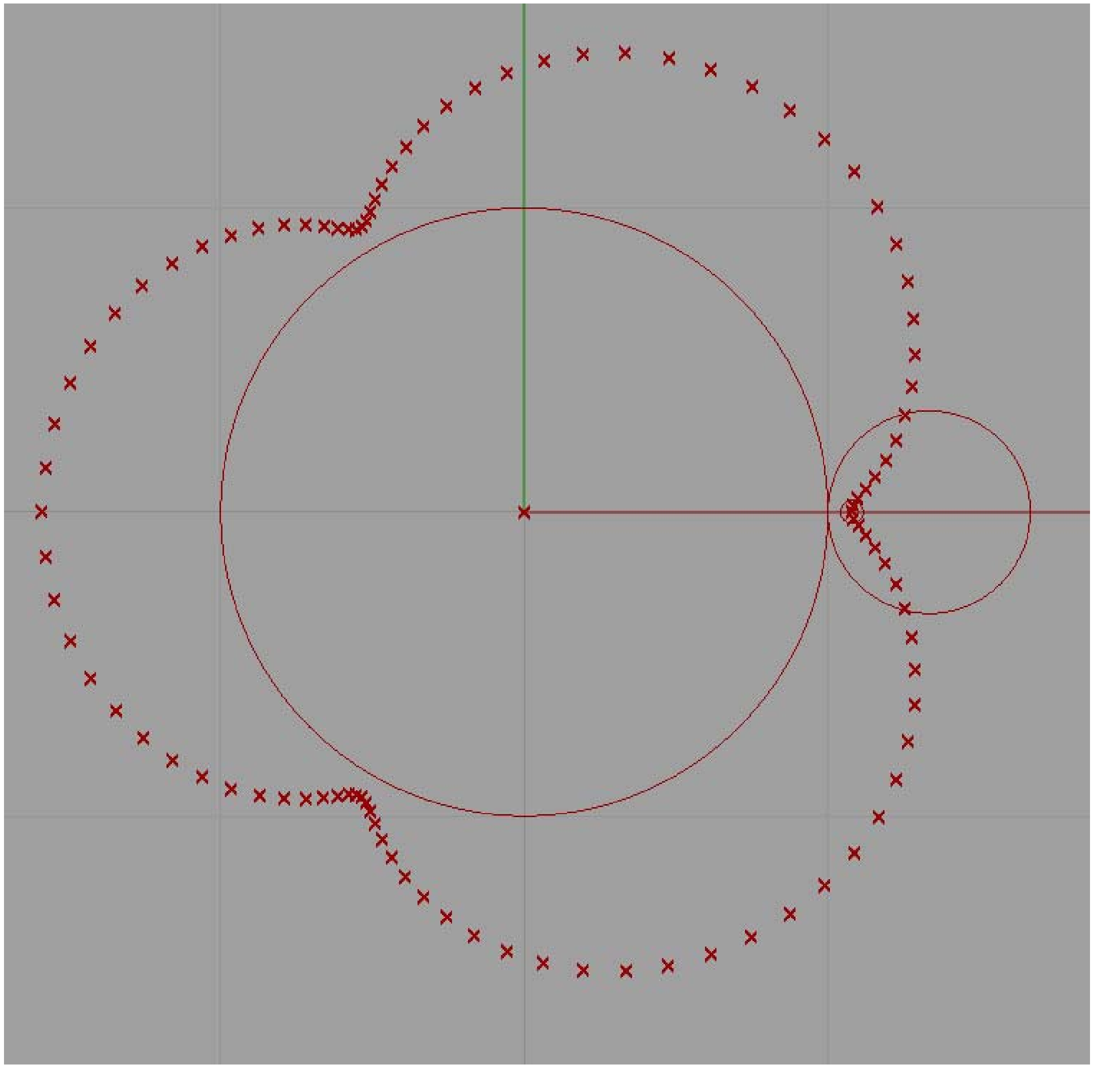
EPITROCHOID CURVE



MINIPROJEKT 5

Teachers: Martin Raussen, Poul Henning Kirkegaard, Dario Parigi

We will produce a visual picture of the epitrochoid curve by drawing a large number *N* of points on canvas tracing out this curve.
The epitrochoid curve is generated by a point attached to a circle of radius ***r2*** (the rolling circle) rolling around the outside of a fixed circle of radius ***r1***, where the point is at a distance ***d*** from the center of the rolling circle.

If we analyse the trajectory of the tracing point we realize that it is determined by **two rotations**

a) the rotation around the center of the fixed circle
b) the rotation around the center of the rolling circle

and their **amplitude**

a) the rotation around the fixed circle is by an angle of 2*pi (360°)
b) the rotation around the canter of the rolling circle is by an angle of 2*pi****R***, where ***R*** is the ratio between the radius of the fixed circle and the radius of the rolling circle. The rolling circle needs to rotate R times around the fixed circle to go back to the starting position and complete a full circle.

1 -Define an arbitrary radius ***r1*** of the fixed circle ,then define the ratio ***R*** with a slider of type "integer" (from 1 to 10 for example).
Use the ratio ***R*** to define the radius ***r2*** of the rolling circle and draw the second circle attached to a point of the fixed circle .
Hint: the centers of the circles will be at a distance of ***r1***+***r2***. Define the position of the center of the rolling circle parametrically using ***r1*** and ***r2***, so that when changing ***r1*** or ***R*** it adjusts accordingly.

2 - Draw the radius of the rolling circle starting from its center. Use the radius to define
-the position of the tracing point ***d*** using the component "eval"
-the center of the rolling circle, coincident with one end of the radius, with the component "end points"

3- Now you must apply the two rotations to the tracing point.
-The first rotation is of amplitude 2*pi around the fixed circle. Use the "range" component to subdivide ***N*** times the full angle, to have the position of the tracing point in ***N*** intermediate positions, that identify the trajectory of the point during the rotation.
Hint: ***N*** should be >=100 to produce a smooth visual output. Use a slider of type "integer" for its definition
- The second and last rotation of the tracing point is of amplitude 2*pi*R. Use again the "range" component to subdivide the angle ***N*** times. The center of the rotation is the center of the rolling circle while it rotates around the fixed circle.
Hint: the position of the center of the rolling circle while it rotates can be easily determined by applying to the center the same rotation around the fixed circle used in the previous step for the tracing point trajectory.

NOTE:
-you can change the order in which you apply the two rotations.
-use the sliders to obtain variations of the epitrochoid curve