Maple Project I

Polar Plots

To plot in maple the**parametric equations**

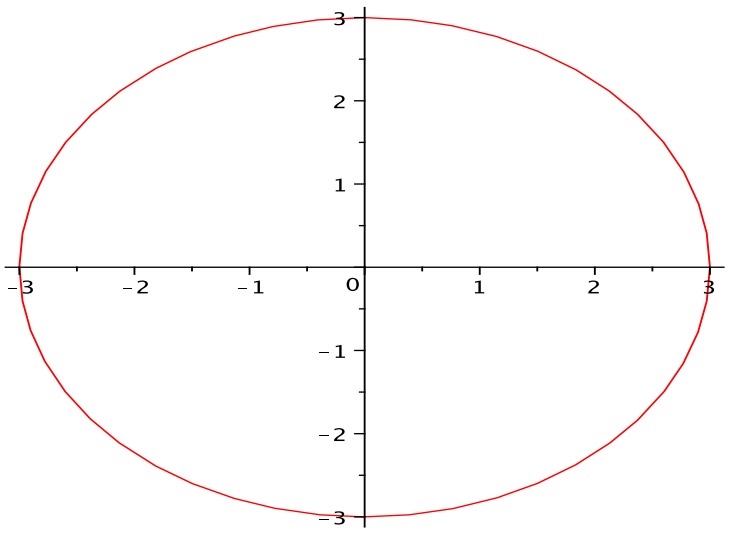
$$x=f(t),\ y=g(t),\ \text{with } t \text{ in } [a,b]$$

We type the command:

$$\text{plot}([f(t),\ g(t),\ t=a..b]);$$

For example, to plot a circle of radius 3 centered at the origin, we type

```
> plot([3*cos(t), 3*sin(t), t=0..2*Pi], scaling=constrained);
```



To plot the polar equation

$$r=r(t),\ t \text{ in } [\text{alpha},\ \text{beta}]$$

where alpha and beta are certain angles, we need to convert the given equation from**polar coordinates**to**rectangularcoordinates**using the equations:

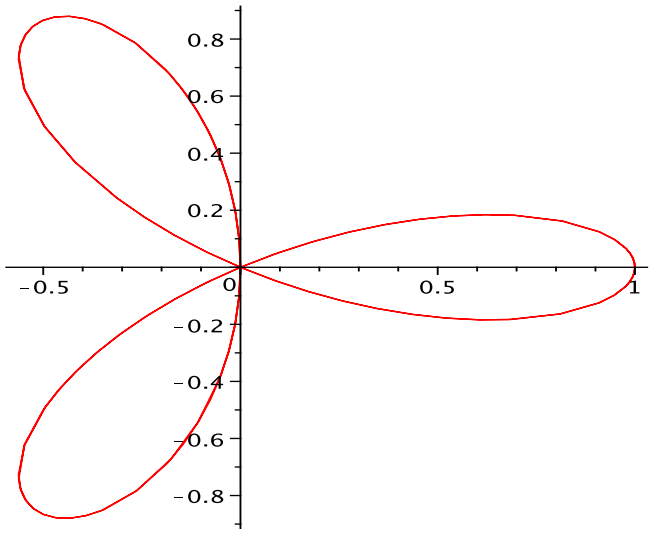
$$x = r\cos(t),\ y = r\sin(t)$$

Example:
Plot the polar equation

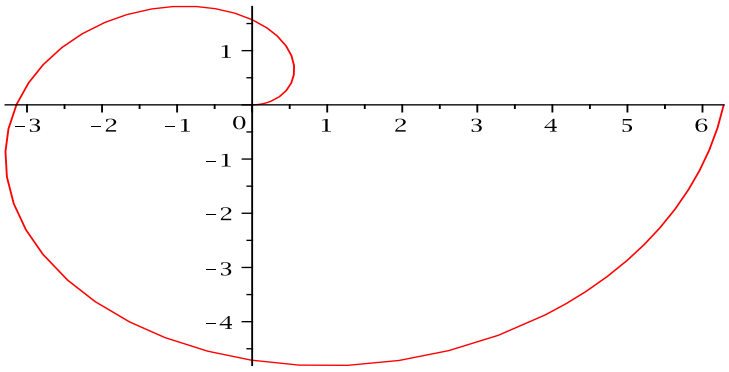
$$r = \cos\ (\ 3\ t\ ),\ \text{where t in } [0,\ 2Pi]$$

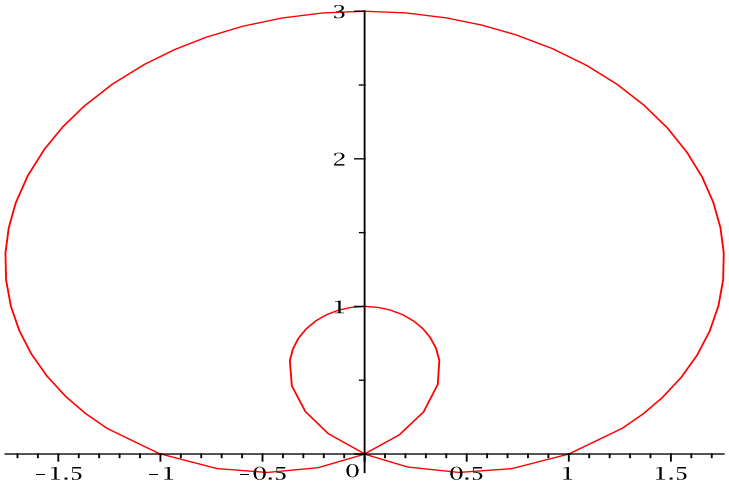
In maple format:

```
> r:=cos(3*t):  plot([r*cos(t), r*sin(t), t=0..2*Pi], scaling=constrained);
```

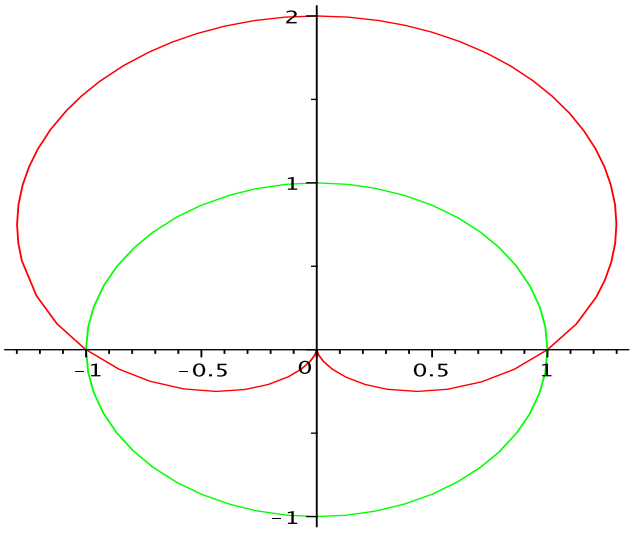



```
> r:=t:  plot([r*cos(t), r*sin(t), t=0..2*Pi], scaling=constrained);
```

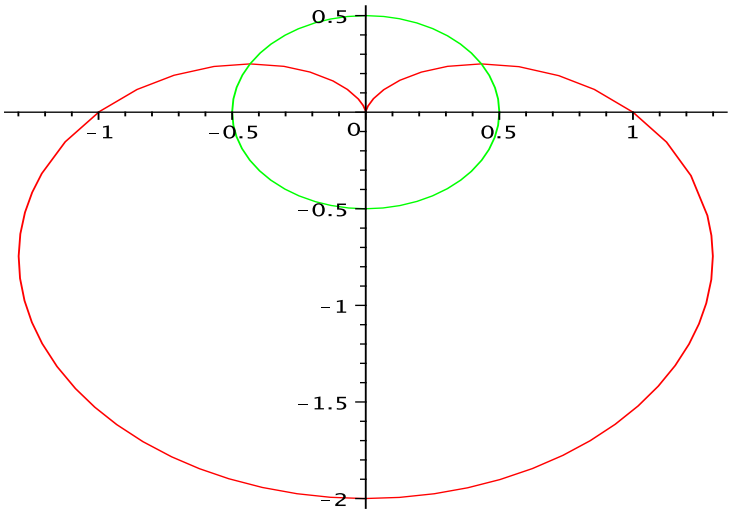




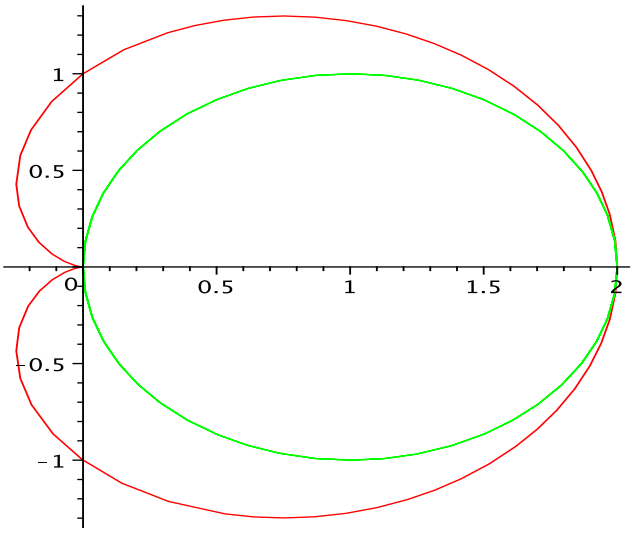

```
> s:=1: r:=1+sin(t): plot({[s*cos(t), s*sin(t), t=0..2*Pi], [r*cos(t),
r*sin(t), t=0..2*Pi]}, scaling=constrained);
```



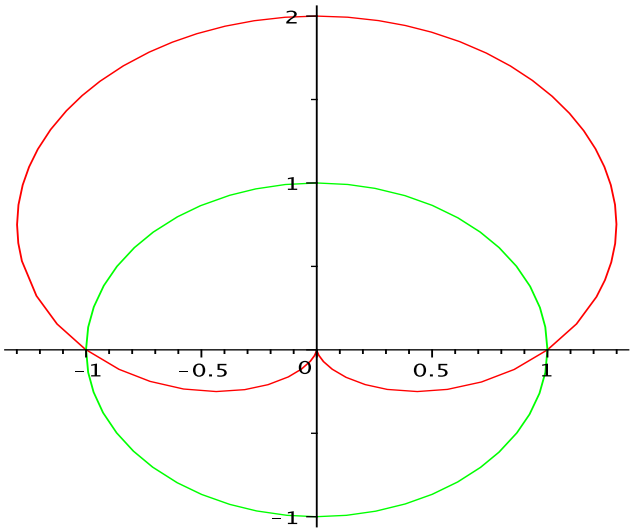

```
> s:=1./2: r:=1-sin(t): plot({[s*cos(t), s*sin(t), t=0..2*Pi],
[r*cos(t), r*sin(t), t=0..2*Pi]}, scaling=constrained);
```




```
> s:=2*cos(t): r:=1+cos(t): plot({[s*cos(t), s*sin(t), t=0..2*Pi],
[r*cos(t), r*sin(t), t=0..2*Pi]}, scaling=constrained);
```




```
> r:=1+sin(t): s:=1: plot({[r*cos(t), r*sin(t), t=0..2*Pi], [s*cos(t),
s*sin(t), t=0..2*Pi]}, scaling=constrained);
```



Homework:

1). Using constrained scaling, plot the ellipse

$$x = 3 \cos(t) \text{ and } y = \sin(t)$$

2). Curves of the form:

equation1: r= a sin (n*t) orequation2: r= a cos (n*t) for "a ¿0" and "n¿0" are called Roses. For "a=2" and "n=3" draw the graphs of equations 1 and 2, compare them and report your observations. Repeat this step for "a=2" and "n=4". 3). Curves of the form:

equation1: r=a+b sin (t) orequation2: r= a+b cos(t)
are called "limacons". Repeat the steps in problem(2) for this problem with "a=2 and b=3" , "a=2 and b=-3" and
"a=2 and b=1". **4).**Graph each of the following equations.
a).r = sin (2t)
b).r= 2cos (t) + 1
c).r^2= cos (2 t) **5).**Find the intersection points of the parabolas

$$r= 1/(1 - \cos (t)) \text{ and } r= 3/(1 + \cos (t))$$

Hint: To get a better display of the graphs restrict your plot to the window [-5, 5]x[-5,5]