In [0]:

```
reset()
```

In [0]:

```
plot(sin(x),(0,8*pi))
```

In [0]:

```
plot(sin(x),(0,8*pi))+point([0,0], color='red',size=200)
```

In [0]:

```
lista_de_figuras=[plot(sin(x),(0,8*pi))+point([8*pi*k,sin(8*pi*k)], color='red',size
=40) for k in srange(0.1, 1.0,step=0.02)]
```

In [0]:

```
animate(lista_de_figuras)
```

In [0]:

```
a=animate(lista_de_figuras)
```

In [0]:

```
save(a,'ponto_seno.mp4')
```

In [0]:

```
save(a,'ponto_seno.gif')
```

In [0]:

```
save(a,'ponto_seno.avi')
```

In [0]:

```
save(a,'ponto_seno.webm')
```

In [0]:

```
save(a,'ponto_seno.wmv')
```

In [0]:

```

```

In [0]:

```
%time
t=var('t')
def Circulo(theta):
    circulo=parametric_plot((2*(sin(2*pi*t)), 2*(cos(2*pi*t))), (t,0, theta),
                                        linestyle='-', color='black',aspect_ratio=1)
    #p=point((2*(sin(theta)), 2*(cos(theta))))
    return  circulo#+p

b = animate([Circulo(i) for i in srange(0.1, 1.1,step=0.05)] , axes = True,aspect_ra
tio=1)
b.show(delay=50)
```

In [0]:

```
save(b,'circulo2.gif')
```

In [0]:

```
%time
t=var('t')
def Circulo(theta):
    circulo=parametric_plot((2*(sin(2*pi*t)), 2*(cos(2*pi*t))), (t,0, theta),
                                        linestyle='-', color='black')
    linha=line([(-3,-3),(-3,3),(3,3),(3,-3)])
    return  circulo+linha

c = animate([Circulo(i) for i in srange(0.1,1,step=0.01)] ,figsize = [5,5], axes = T
rue,aspect_ratio=1)
c.show(delay=50)
```

In [0]:

```
save(c,'circulo3.gif')
```

In [0]:

```
%time
t=var('t')
def Circulo(theta):
    circulo=parametric_plot((2*(sin(2*pi*t)), 2*(cos(2*pi*t))), (t,0, theta),
                                        linestyle='-', color='black')
    linha=line([(-3,-3),(-3,3),(3,3),(3,-3)])
    return  circulo+linha+point((2*(sin(2*pi*theta)), 2*(cos(2*pi*theta))),color='re
d',size=20)

d = animate([Circulo(i) for i in srange(0.1,1,step=0.01)] ,figsize = [5,5], axes = T
rue,aspect_ratio=1)
d.show(delay=50)
```

In [0]:

```
save(d,'circulo4.gif')
```

In [0]:

```
%var t
npi=10*pi
a=sqrt(2)
b=1
def epiciclo(theta):
    circulo_grande_plot_fixo=parametric_plot((a*(sin(t)), a*(cos(t))), (t,0.001, npi
),
                                        linestyle='--', color='black',  title='Epicic
los animada com Sage by Marcelo') #Circulo Grande Fixo
    centro_circulo_pequeno=point(((a-b)*cos(theta),(a-b)*sin(theta)),color='black',s
ize=20)
    ponto=point(((a-b)*(cos(theta))+b*cos(((a-b)/b)*theta), (a-b)*(sin(theta))-b*sin
(((a-b)/b)*theta)), color='red',size=30)
    circulo_pequeno_plot=circle(((a-b)*cos(theta),(a-b)*sin(theta)), b)
    hipociclo_plot=parametric_plot(((a-b)*(cos(t))+b*cos(((a-b)/b)*t), (a-b)*(sin(t
))-b*sin(((a-b)/b)*t)),
                                    (t,0.001, theta),linestyle='-', color='red')
    return  circulo_grande_plot_fixo+centro_circulo_pequeno+hipociclo_plot+circulo_p
equeno_plot+ponto

e = animate([epiciclo(i) for i in srange(.05,npi-.05,npi/60)],xmax = (3/2)*a, ymin =
-(3/2)*a, ymax = (3/2)*a, figsize = [10,10], axes = True)
e.show(delay=50)
```

In [0]:

```
save(e,'epiciclo.gif')
```

In [0]:

```
%var t
npi=100*pi
a=10
b=sqrt(2)
def Hipociclo(theta):
    circulo_grande_plot_fixo=parametric_plot((a*(sin(t)), a*(cos(t))), (t,0.001, 4*p
i),
                                        linestyle='-', title='Hipociclos animada com
 Sage by Marcelo')
    centro_circulo_pequeno=point(((a+b)*cos(theta),(a+b)*sin(theta)),color='black',s
ize=20)
    r_0=((a-b)*cos(theta),(a-b)*sin(theta))
    ponto=point(((a+b)*(cos(theta))-b*cos(((a+b)/b)*theta), (a+b)*(sin(theta))-b*sin
(((a+b)/b)*theta)), color='red',size=30)
    circulo_pequeno_plot=circle(((a+b)*cos(theta),(a+b)*sin(theta)), b)
    hipociclo_plot=parametric_plot(((a+b)*(cos(t))-b*cos(((a+b)/b)*t), (a+b)*(sin(t
))-b*sin(((a+b)/b)*t)),
                                    (t,0.001, theta),linestyle='-', color='red')
    return  circulo_grande_plot_fixo+centro_circulo_pequeno+hipociclo_plot+ponto+cir
culo_pequeno_plot

f = animate([Hipociclo(i) for i in srange(.05,npi-.05,npi/360)], xmin = -(2)*a,xmax
= (2)*a, ymin = -(2)*a, ymax = (2)*a, figsize = [10,10], axes = True)
f.show()
```

In [0]:

```
save(f,'Hipociclo.gif')
```

In [0]:

```

```

In [0]:

```

```