Drawing heart

The parametric equation of heart curve is:
$x = 16\sin(\theta)^3 - 10$
$y = 13\cos(\theta) - 5\cos(2\theta) - 2\cos(3\theta) - \cos(4\theta)$

The shape of heart and all other parametric shapes can be controlled by adding an aditional size parameter **"r"**. This can be multiplied with the above equation resulting in a magnified or dimnished image.

Code :

```
import turtle
from math import pi, cos, sin

turtle.pencolor("#f00")
turtle.fillcolor("#f00")
turtle.begin_fill()

r = 5
for i in range(360):
    a = i*(pi/180)

    x = r * 16 * pow(sin(a), 3) - 10;
    y = r * (13 * cos(a) - 5 * cos(2 * a) - 2 * cos(3 * a) - cos(4 * a));

    turtle.goto(x, y)

turtle.end_fill()

turtle.mainloop()
```

Clover

Three leafed clover

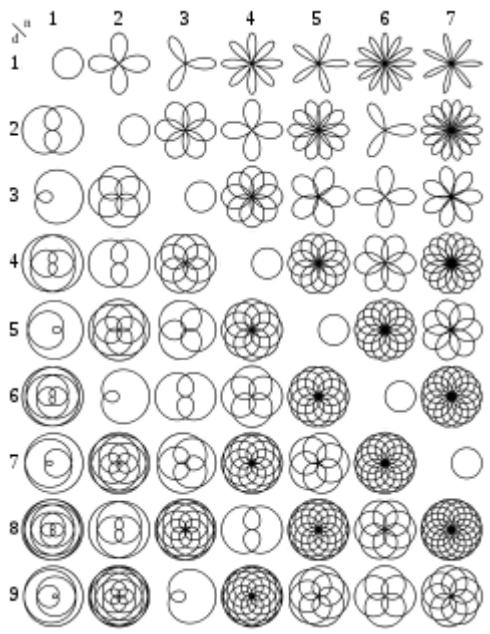
The parametric equaiton of a three leaved clover is:
$r = (\sin(\frac{3\theta}{2}) + \sin(\frac{9\theta}{10}))^2$

We can convert them into the rectangular co-ordinates in the following way
$x = r\cos(\theta)$
$y = r\cos(\theta)$

Code

```
import turtle
from math import pi, cos, sin

turtle.pencolor("#0f0")
turtle.fillcolor("#0f0")
turtle.begin_fill()

size = 15
for i in range(360):
    a = i*(pi/180)

    part_a = sin((3 * a) / 2);
    part_b = sin((9 * a) / 2) / 5;
    r = pow(size * (part_a + part_b), 2);

    x = r * cos(a);
    y = r * sin(a);

    turtle.goto(x, y)

turtle.end_fill()

turtle.mainloop()
```

Rose curves



$k = n/d$
$r = a\cos(k\theta)$
We can transform them into rectanglular from in thefollowing fashion

$x = r\cos(\theta)$
$y = r\sin(\theta)$

Code:

```
import turtle
from math import pi, cos, sin

turtle.pencolor("SpringGreen2")
turtle.bgcolor("#383838")

turtle.pensize(5)
turtle.speed(20)
turtle.up()

shape_size = 10

# Change the ratio here!
k = 5/ 4

for i in range(1, 4*360):
    a = i  * (pi/ 180)
    A = 10;
    r = shape_size * A * cos(k * a);
    x = r * cos(a);
    y = r * sin(a);

    turtle.goto(x, y)
    turtle.down()

turtle.mainloop()
```

Star

The parametric equaiton of a Star leaved clover is:

$x = 4\cos(\theta) + \cos(4\theta)$
$y = 4\sin(\theta) - \sin(4\theta)$

The shape of Star and all other parametric shapes can be controlled by adding an aditional size parameter **"r"**. This can be multiplied with the above equation resulting in a magnified or dimnished image.

Code :

```
import turtle
from math import pi, cos, sin

turtle.pencolor("SpringGreen2")
turtle.bgcolor("#383838")

turtle.pensize(5)
turtle.speed(20)
turtle.up()

shape_size = 10

for i in range(1, 4*360):
    a = i * (pi/ 180)

    x = 4 * cos(a) + cos(4 * a);
    x *= shape_size;

    y = 4 * sin(a) - sin(4 * a);
    y *= shape_size;

    turtle.goto(x, y)
    turtle.down()

turtle.mainloop()
```

Star_4

The parametric equaiton of a 4 leaved star is:
$x = (r\cos\theta)^3$
$y = (r\sin\theta)^3$

The shape of 4 Pointed star and all other parametric shapes can be controlled by adding an aditional size parameter **"r"**. This can be multiplied with the above equation resulting in a magnified or dimnished image.

Code:

```
import turtle
from math import pi, cos, sin

turtle.pencolor("SpringGreen2")
turtle.bgcolor("#383838")

turtle.pensize(5)
turtle.speed(20)
turtle.up()

shape_size = 10

for i in range(1, 4*360):
    a = i * (pi/ 180)

    x = pow(pow(shape_size, 0.8) * cos(a), 3);
    y = pow(pow(shape_size, 0.8) * sin(a), 3);

    turtle.goto(x, y)
    turtle.down()

turtle.mainloop()
```

Butterfly

The parametric eqation of butterfly goes as follows:
$x = \cos\theta \times 6\sin^2\theta$
$x = -\sin\theta \times 6\cos^2\theta$

The shape of Butterfly and all other parametric shapes can be controlled by adding an aditional size parameter **"r"**. This can be multiplied with the above equation resulting in a magnified or dimnished image.

Code:

```
import turtle
from math import pi, cos, sin

turtle.pencolor("SpringGreen2")
turtle.bgcolor("#383838")

turtle.pensize(5)
turtle.speed(20)
turtle.up()

shape_size = 10

for i in range(1, 4*360):
    a = i * (pi/ 180)

    x = cos(a) * pow((sin(a) * 6), 2)
    y = sin(a) * pow((-cos(a) * 6), 2)

    x *= shape_size;
    y *= shape_size;

    turtle.goto(x, y)
    turtle.down()

turtle.mainloop()
```