```
> #Hrudai Battini hw9
  read "/Users/hb334/documents/M9.txt";
  Help9();
```

Orb(f,x,x0,K1,K2), Orb2D(f,x,x0,K) , FP(f,x) , SFP(f,x) , Comp(f,x) **(1)**

```
> #1
  f1 := 2*x*(1-x);
  SFP(f1,x);
  f2 := 2.5*x*(1-x);
  SFP(f2,x);
  f3 := 3.1*x*(1-x);
  SFP(f3,x);
  f4 := (4+x)/(3+x);
  SFP(f4,x);
  f5 := (3+x)/(4+x);
  SFP(f5,x);
  f6 := (3+x+x^2)/(4+x+x^2);
  SFP(f6,x);
```

$$f1 := 2\,x\,(1-x)$$

$$[0.5000000000]$$

$$f2 := 2.5\,x\,(1-x)$$

$$[0.6000000000]$$

$$f3 := 3.1\,x\,(1-x)$$

$$[\ ]$$

$$f4 := \frac{4+x}{3+x}$$

$$[1.236067977]$$

$$f5 := \frac{3+x}{4+x}$$

$$[0.791287848]$$

$$f6 := \frac{x^2+x+3}{x^2+x+4}$$

$$[0.8177316732]$$ **(2)**

```
> #2
  p := (x+1)/(x+2);
  solve(evalf(p-x));
  q:= diff(p,x);
  solve(q);
  FP(p,x);
  SFP(p,x);

  p2 := (x+2)/(x+3);
  solve(evalf(p2-x));
  q2 := diff(p2,x);
  solve(q2);
  FP(p2,x);
  SFP(p2,x);
```

```
p3 := (x+12)/(x+17);
solve(evalf(p3-x));
q3 := diff(p3,x);
solve(q3);
FP(p3,x);
SFP(p3,x);
```

$$p := \frac{x+1}{x+2}$$

$$-1.618033989, 0.6180339888$$

$$q := \frac{1}{x+2} - \frac{x+1}{(x+2)^2}$$

$$[-1.618033988, 0.6180339880]$$

$$[0.6180339880]$$

$$p2 := \frac{x+2}{3+x}$$

$$-2.732050808, 0.7320508076$$

$$q2 := \frac{1}{3+x} - \frac{x+2}{(3+x)^2}$$

$$[-2.732050808, 0.732050808]$$

$$[0.732050808]$$

$$p3 := \frac{x+12}{x+17}$$

$$-16.71779789, 0.7177978871$$

$$q3 := \frac{1}{x+17} - \frac{x+12}{(x+17)^2}$$

$$[-16.71779789, 0.717797888]$$

$$[0.717797888]$$

(3)

```
> #3
x1 := 1*x*(1-x);
FP(x1,x);
SFP(x1,x);
x2 := 2*x*(1-x);
SFP(x2,x);
x3 := 4/3*x*(1-x);
SFP(x3,x);
x4 := 4.0*x*(1-x);
SFP(x4,x);
#The Bifurcation point is at 3 and there is no stable fixed point
at x =0 as the condition abs(diff(f)) <1 is not met under any
condition with 0 for x.
```

$$x1 := x\,(1-x)$$

$$[0., 0.]$$

$$[\,]$$

$$x2 := 2\,x\,(1-x)$$

$$[0.5000000000]$$

$$x3 := \frac{4\,x\,(1-x)}{3}$$

$$[0.2500000000]$$

$$x4 := 4.0\,x\,(1-x)$$

$$[\,]$$ **(4)**

```
> #4
  y1 := x1*(1-x1);
  SFP(x1,x);
  y2 := 2*x2*(1-x2);
  SFP(x2,x);
  y3 := 4/3*x3*(1-x3);
  SFP(x3,x);

  #The second bifurcation point is at 4/3 where the orbit converges
  to 0.25.
  Orb(y3, x, 0.5,1000,1010);
```

$$y1 := x\,(1-x)\,(1-x\,(1-x))$$

$$[\,]$$

$$y2 := 4\,x\,(1-x)\,(1-2\,x\,(1-x))$$

$$[0.5000000000]$$

$$y3 := \frac{16\,x\,(1-x)\left(1-\frac{4\,x\,(1-x)}{3}\right)}{9}$$

$$[0.2500000000]$$

[0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002, 0.2500000002] **(5)**

```
> #5 Read.
```