

```
> #Hw 11 Hrudai Battini
read "/Users/hb334/Documents/M11.txt";
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
print(SFPe);
#Reading the code for SFPe, I take the derviative and set the
equation equal to x for  $x_n = kx_{n-1}(1 - x_{n-1})$ , will yield a single
#fixed point, (0,k).
```

(2)

```
proc(f,x)
  local fl, L, i;
  fl := diff(f,x);
  L := [solve(f=x,x)];
  [seq([L[i], normal(subs(x=L[i],fl))], i=1..nops(L))]
end proc
```

```
> #2
Orb(3.1*x*(1-x),x,0.1,1000,1004);
Orb(3.5*x*(1-x),x,0.1,1000,1004);
Orb(3.4*x*(1-x),x,0.1,1000,1004);
Orb(3.45*x*(1-x),x,0.1,1000,1004); #Second Bifurcation point
discretly at k = 3.45.

[0.5580141258, 0.7645665197, 0.5580141258, 0.7645665197, 0.5580141258, 0.7645665197]
[0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111]
[0.8421543994, 0.4519632478, 0.8421543994, 0.4519632478, 0.8421543994, 0.4519632478]
[0.8525250119, 0.4337551002, 0.8473600659, 0.4462263969, 0.8525239786, 0.4337576135]
```

(3)

```
> #3
SFPe(x^(-b)*x,x); #This model does not seem to work. Otherwise it
has a stable fixed point at 1 if |1-b| < 1.
SFPe(x*exp(r*((1-x)/k)),x); #x=0 when r<0. x=k when |1-r|<1 when
0<r<2.
SFPe(lambda*x*(1+alpha*x)^(-beta),x); #x=(e^ln(1)/b - 1)/a when
|1/e| < 1 for any constant values lambda, Beta.
```

$$\begin{aligned} & [[0, 0], [1, 1 - b]] \\ & [[0, e^r], [k, e^0 - r e^0]] \\ & \left[ [0, \lambda], \left[ \frac{e^{\frac{\ln(\lambda)}{\beta}} - 1}{\alpha}, -\frac{\lambda \left( e^{\frac{\ln(\lambda)}{\beta}} \right)^{-\beta} \left( \beta e^{\frac{\ln(\lambda)}{\beta}} - e^{\frac{\ln(\lambda)}{\beta}} - \beta \right)}{e^{\frac{\ln(\lambda)}{\beta}}}} \right] \right] \end{aligned}$$

(4)

```
> #4
Orbk(2,x,(x[2]+1*x[1])/(1*x[2]+x[1]),[1.1,5.3],1,4);
Orbk(2,x,(x[2]+1*x[1])/(2*x[2]+x[1]),[1.1,5.3],1000,1003);
Orbk(2,x,(x[2]+1*x[1])/(3*x[2]+x[1]),[1.1,5.3],1000,1003);
Orbk(2,x,(x[2]+1*x[1])/(4*x[2]+x[1]),[1.1,5.3],1000,1003);
Orbk(2,x,(x[2]+2*x[1])/(1*x[2]+x[1]),[1.1,5.3],1000,1003);
```

```

Orbk (2, x, (x[2]+2*x[1]) / (2*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+2*x[1]) / (3*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+2*x[1]) / (4*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+3*x[1]) / (1*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+3*x[1]) / (2*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+3*x[1]) / (3*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+3*x[1]) / (4*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+4*x[1]) / (1*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+4*x[1]) / (2*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+4*x[1]) / (3*x[2]+x[1]), [1.1, 5.3], 1000, 1003);
Orbk (2, x, (x[2]+4*x[1]) / (4*x[2]+x[1]), [1.1, 5.3], 1000, 1003);

```

[1.1, 5.3, 1, 1]

```

[0.6666666665, 0.6666666665, 0.6666666665, 0.6666666665]
[0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000]
[0.4000000000, 0.4000000000, 0.4000000000, 0.4000000000]
[1.5000000000, 1.5000000000, 1.5000000000, 1.5000000000]
[1.0000000000, 1.0000000000, 1.0000000000, 1.0000000000]
[0.7500000002, 0.7500000002, 0.7499999998, 0.7499999998]
[0.6000000002, 0.6000000000, 0.5999999998, 0.6000000000]
[2.0000000000, 2.0000000000, 2.0000000000, 2.0000000000]
[1.3333333333, 1.3333333333, 1.3333333333, 1.3333333333]
[1.0000000000, 1.0000000000, 1.0000000000, 1.0000000000]
[0.7999999999, 0.8000000004, 0.8000000002, 0.7999999998]
[2.5000000000, 2.5000000000, 2.5000000000, 2.5000000000]
[1.6666666667, 1.6666666667, 1.6666666667, 1.6666666667]
[1.2500000001, 1.2500000001, 1.2500000000, 1.2499999999]
[1.0000000000, 1.0000000000, 1.0000000000, 1.0000000000]

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(5)



Hudson B. Hw 11

4b)

$$y = x \cdot \frac{2+z+a}{bzt+2}$$

$$\frac{b(1+a)}{z(2+z+a)} = z$$

$$z = \frac{1+a}{b+1}$$

$x(x \cdot \frac{2+z+a}{bzt+2})$