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> #OK to Post Homework!
#Jeton Hida, Assignment 8, October 4, 2021.
read "/Users/jeton/Desktop/Math 336/M9.txt"
> Help9()
      Orb(f,x,x0,K1,K2), Orb2D(f,x,x0,K) , FP(f,x) , SFP(f,x) , Comp(f,x)

```

(1)

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> #Question 1
> f:=(1+7*x)/(1+1*x)

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(2)

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> a:=proc(n) option remember;
  if n=0 then
    1:
  else (1+7*a(n-1))/(1+1*a(n-1)):
  fi:
end proc:
> seq(a(n), n=0..1000);
      [Length of output exceeds limit of 1000000]

```

(3)

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> print(FP)
      proc(f,x) evalf([solve(f=x)]) end proc

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(4)

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> FP(f,x)
      [-0.162277660, 6.162277660]

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(5)

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> SFP(f,x)
      [6.162277660]

```

(6)

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> #Sequencing wouldn't work, but we see steady points at the FP
values, and the only stable one is the SFP value of 6.162277660.

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> #Question 2
print(Orb)
proc(f,x,x0,K1,K2)

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(7)

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  local x1,i,L;
  x1 := x0;
  for i to K1 do x1 := subs(x=x1,f) end do;
  L := [x1];
  for i from K1 to K2 do x1 := subs(x=x1,f); L := [op(L),x1] end do;
  L

```

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end proc
> f:=1*x*(1-x)
      f:= x (1 - x)

```

(8)

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> Orb(f,x,.5,1,1000)
[0.25, 0.1875, 0.15234375, 0.1291351318, 0.1124592495, 0.09981216670, 0.08984969808,
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```

(9)

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0.001079215525, 0.001078050819, 0.001076888625, 0.001075728936, 0.001074571743,  
0.001073417039, 0.001072264815, 0.001071115063, 0.001069967775, 0.001068822944,  
0.001067680562, 0.001066540620, 0.001065403111, 0.001064268027, 0.001063135361,  
0.001062005104, 0.001060877249, 0.001059751789, 0.001058628715, 0.001057508020,  
0.001056389697, 0.001055273738, 0.001054160135, 0.001053048881, 0.001051939969,  
0.001050833391, 0.001049729140, 0.001048627209, 0.001047527590, 0.001046430276,  
0.001045335260, 0.001044242534, 0.001043152092, 0.001042063926, 0.001040978029,  
0.001039894394, 0.001038813014, 0.001037733882, 0.001036656990, 0.001035582332,  
0.001034509901, 0.001033439690, 0.001032371692, 0.001031305901, 0.001030242309,  
0.001029180910, 0.001028121697, 0.001027064663, 0.001026009801, 0.001024957105,  
0.001023906568, 0.001022858183, 0.001021811944, 0.001020767844, 0.001019725877,  
0.001018686036, 0.001017648315, 0.001016612707, 0.001015579206, 0.001014547805,  
0.001013518498, 0.001012491278, 0.001011466139, 0.001010443075, 0.001009422080,













```
0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000,  
0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000,  
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0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000,  
0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000, 0.5000000000]
```

```
> #Steady state at .5 when k=2
```

```
> f:=2.5*x*(1-x):
```

```
> Orb(f,x,.5,1,1000)
```

```
[0.625, 0.5859375, 0.6065368652, 0.5966247410, 0.6016591485, 0.5991635438,  
0.6004164790, 0.5997913268, 0.6001042278, 0.5999478590, 0.6000260638,  
0.5999869665, 0.6000065162, 0.5999967418, 0.6000016290, 0.5999991855,  
0.6000004072, 0.5999997965, 0.6000001018, 0.5999999490, 0.6000000255,  
0.5999999872, 0.6000000065, 0.5999999968, 0.6000000015, 0.5999999992,  
0.6000000005, 0.5999999998, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,  
0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000, 0.6000000000,
```

(11)























0.5580141245, 0.7645665203, 0.5580141245, 0.7645665203, 0.5580141245,  
0.7645665203, 0.5580141245, 0.7645665203, 0.5580141245, 0.7645665203,  
0.5580141245, 0.7645665203, 0.5580141245, 0.7645665203, 0.5580141245,  
0.7645665203, 0.5580141245, 0.7645665203, 0.5580141245, 0.7645665203]

> #A period of 2 is shown between points .558 and .764 when k=3.1

> f:=3.5\*x\*(1-x)

$$f := 3.5 x (1 - x)$$

(14)

> Orb(f, x, .5, 1, 1000)

[0.875, 0.3828125, 0.8269348143, 0.5008976952, 0.8749971794, 0.3828199039,  
0.8269408878, 0.5008837956, 0.8749972662, 0.3828196760, 0.8269407010,  
0.5008842230, 0.8749972634, 0.3828196834, 0.8269407069, 0.5008842097,  
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,  
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,  
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,  
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,  
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,  
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,  
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,  
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,  
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,  
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,  
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,  
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,  
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,  
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,  
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,  
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,  
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,  
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,  
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,

(15)











```
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637,
0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827,
0.8269407062, 0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062,
0.5008842111, 0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111,
0.8749972637, 0.3828196827, 0.8269407062, 0.5008842111, 0.8749972637]
```

```
> #Period of 4 is shown between points .3828, .8269, .5008, and .8749
when k=3.5.
```

```
> #Question 3
```

```
> a:=proc(n) option remember:
```

```
  if n=0 then
```

```
    .5:
```

```
  elif n=1 then
```

```
    .7:
```

```
  else (1*a(n-1)+7*a(n-2))/(1*a(n-1)+6*a(n-2)):
```

```
  fi:
```

```
end:
```

```
> seq(a(n), n=0..1000)
```

```
0.5, 0.7, 1.135135135, 1.131205674, 1.142927824, 1.142645975, 1.142862176, 1.142853282,
```

(16)

```
1.142857302, 1.142857071, 1.142857147, 1.142857141, 1.142857143, 1.142857143,
```

```
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
```

```
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
```

```
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
```

```
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
```

```
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
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1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
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1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
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1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
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1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,
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1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,  
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,  
1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143, 1.142857143,  
1.142857143, 1.142857143, 1.142857143

> **#Sequencing does appear to show a steady state at 1.142857143,  
seems to be a stable fixed point as well since we don't start out  
there, but once we get to it we do not leave.**