

> #OK to post

>  
> #Anne Somalwar, 12.06.2021, hw26

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```
read "/Users/annesomalwar/Library/Mobile
Documents/iCloud~is~workflow~my~workflows/Documents/
DMB.txt"
```

*First Written: Nov. 2021*

*This is DMB.txt, A Maple package to explore Dynamical models in Biology (both discrete and continuous) accompanying the class Dynamical Models in Biology, Rutgers University. Taught by Dr. Z. (Doron Zeilbeger)*

*The most current version is available on WWW at:  
<http://sites.math.rutgers.edu/~zeilberg/tokhniot/DMB.txt> .  
Please report all bugs to: DoronZeil at gmail dot com .*

*For general help, and a list of the MAIN functions,  
type "Help();". For specific help type "Help(procedure\_name);"*

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*For a list of the supporting functions type: Help1();  
For help with any of them type: Help(ProcedureName);*

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*For a list of the functions that give examples of Discrete-time dynamical systems (some famous),  
type: HelpDDM());*

*For help with any of them type: Help(ProcedureName);*

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*For a list of the functions continuous-time dynamical systems (some famous) type: HelpCDM());*

For help with any of them type: `Help(ProcedureName);`

(1)

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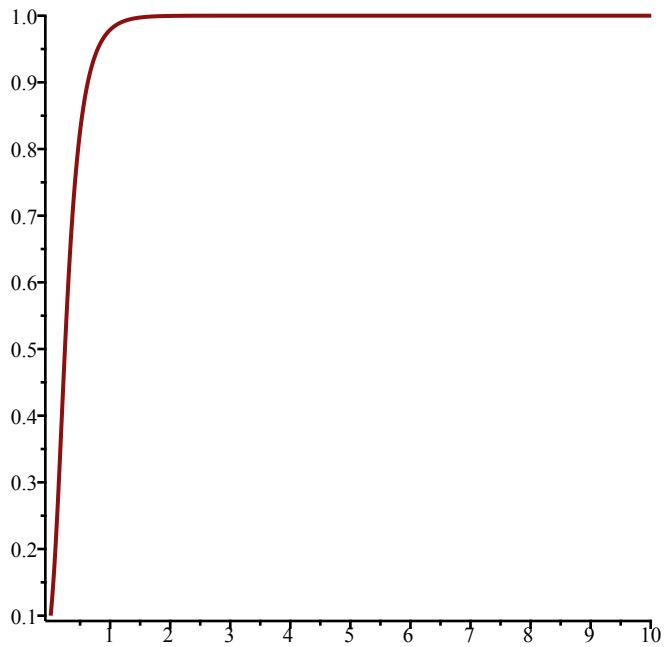
> #P14)

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> #(ii)

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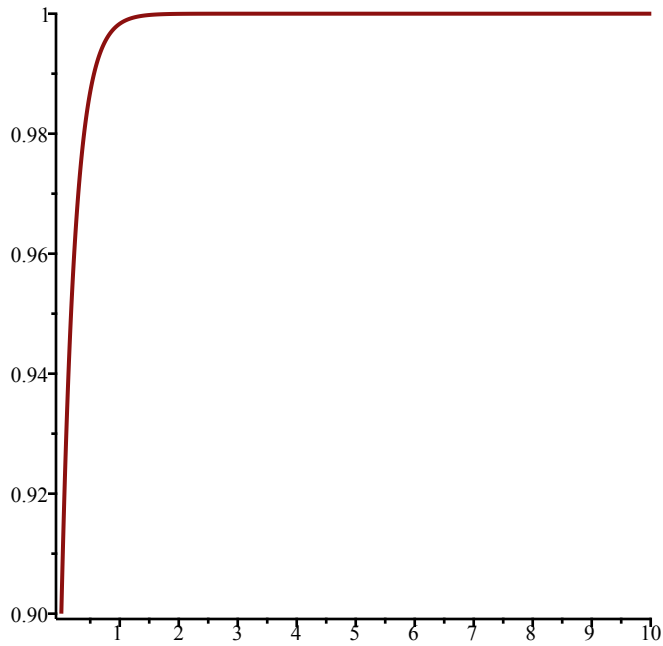
> `TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [0.1],  
0.01, 10, 1);`



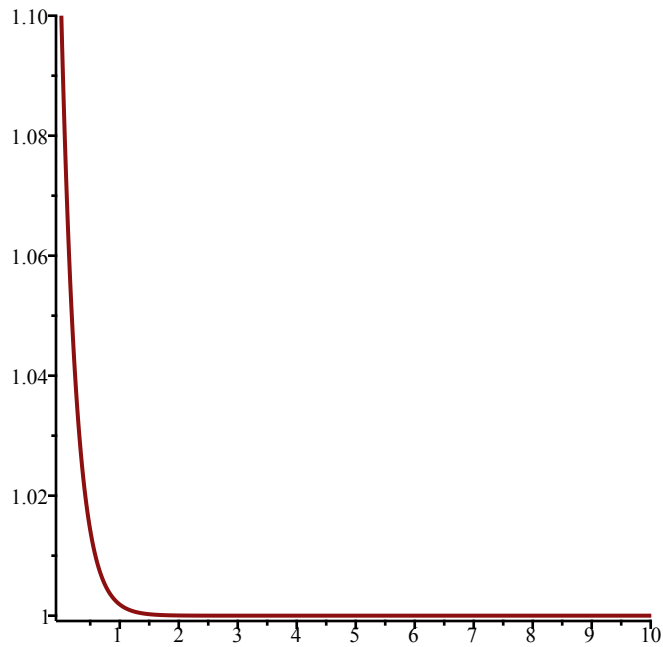
> #Looks like 0 is unstable

>

> `TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [0.9],  
0.01, 10, 1);`



```
> TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [1.1],
0.01, 10, 1);
```



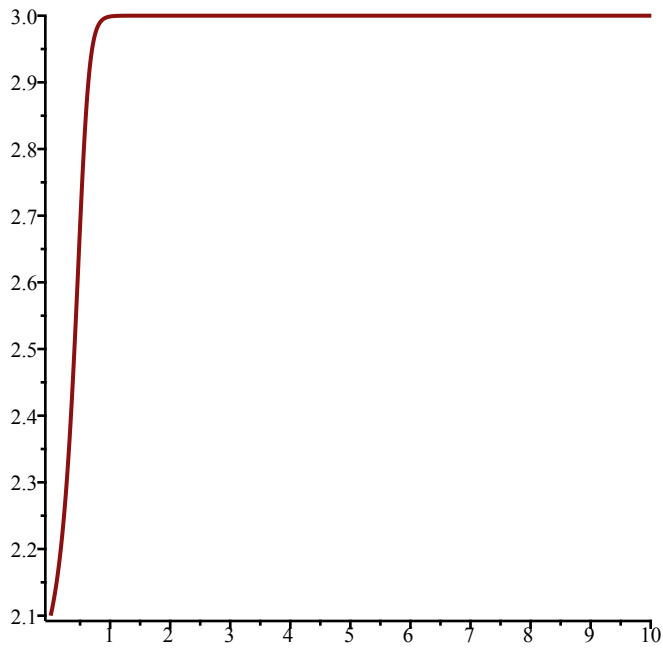
```
> #Looks like 1 is stable
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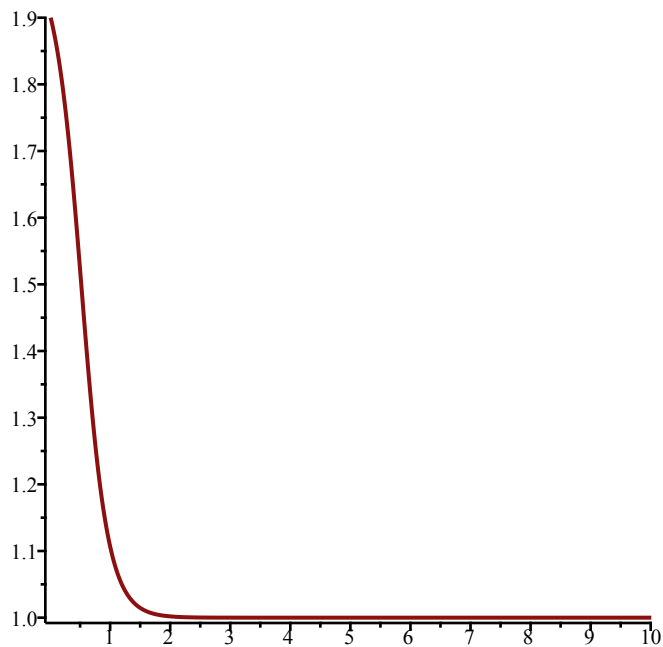
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```
> TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [2.1],
0.01, 10, 1);
```



```
> TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [1.9],
0.01, 10, 1);
```

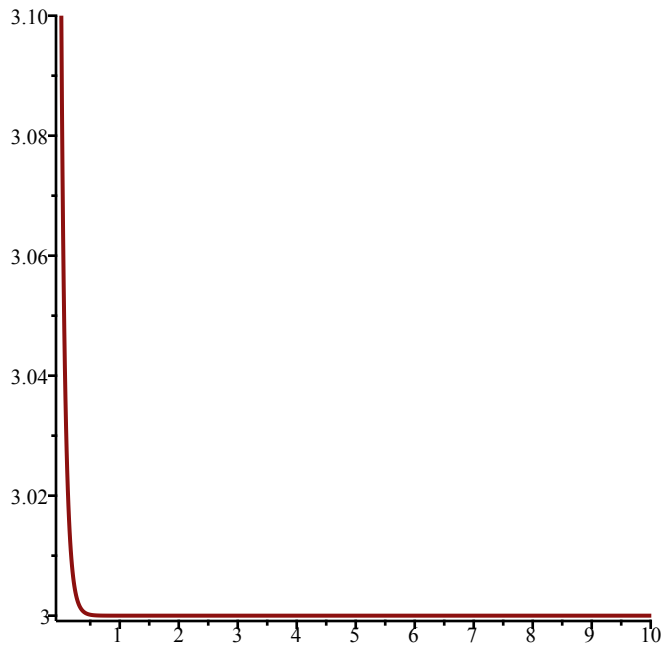


```
> #Looks like 2 is unstable
```

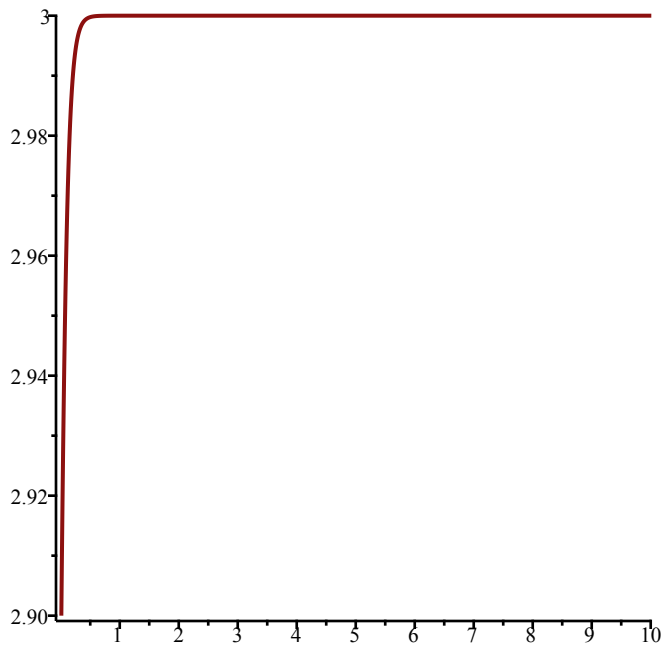
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```
> TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [3.1],
0.01, 10, 1);
```



```
> TimeSeries([2 * x * (1 - x) * (2 - x) * (3 - x)], [x], [2.9],
0.01, 10, 1);
```



```
> #Looks like 3 is stable
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> #P15)
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```
> Orb([x^3 + 2*y, x^2 + 5*y^2], [x, y], [1., 3.], 0, 3);
      [[1., 3.], [7., 46.], [435., 10629.], [8.2334133 × 10^7, 5.65067430 × 10^8]] (2)
```

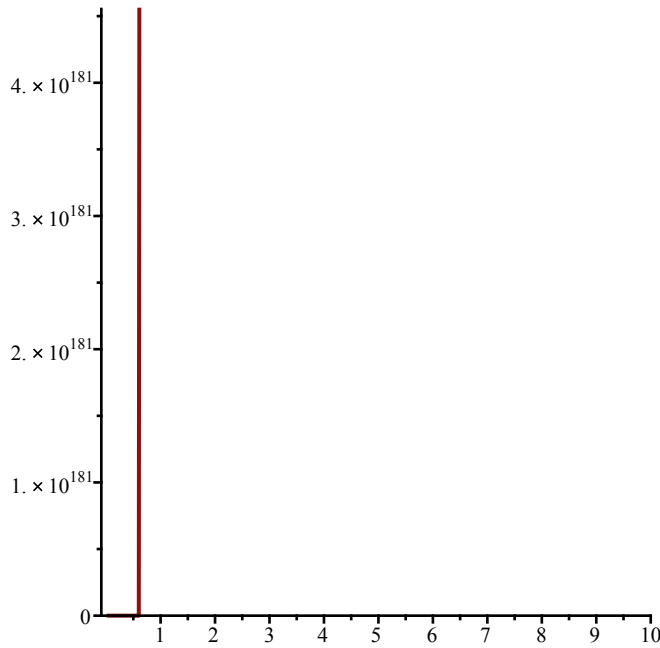
```
> #P16)
```

```
> SFP([ [ (2 + x + y) / (2 + 2*x + 2*y), (2 + x + y) / (1 + 2*x + 2*y) ], [x, y] )
      {[0.6953496364, 0.8641637014]} (3)
```

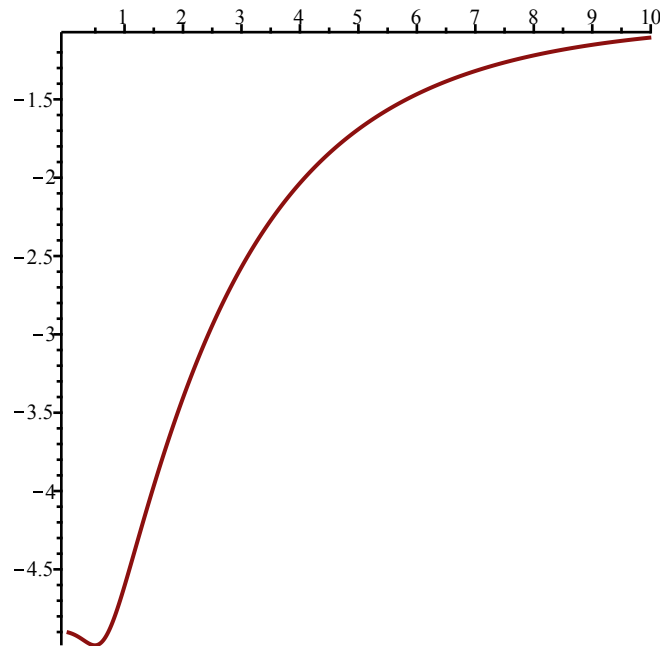
```
> Orb([ [ (2 + x + y) / (2 + 2*x + 2*y), (2 + x + y) / (1 + 2*x + 2*y) ], [x, y], [.5, 0.4],
      1000, 1010)
      [[0.6953496364, 0.8641637013], [0.6953496362, 0.8641637010], [0.6953496365,
      0.8641637015], [0.6953496364, 0.8641637013], [0.6953496362, 0.8641637010],
      [0.6953496365, 0.8641637015], [0.6953496364, 0.8641637013], [0.6953496362,
      0.8641637010], [0.6953496365, 0.8641637015], [0.6953496364, 0.8641637013],
      [0.6953496362, 0.8641637010]] (4)
```

```
> #P17)
```

```
> TimeSeries([ (1 - 2*x - 3*y) * (2 - 2*x - 3*y), (3 - x - 2*y)
      * (1 - x - 2*y) ], [x, y], [-5.1, 4.1], 0.01, 10, 1);
```



```
> TimeSeries([ (1-2*x-3*y) * (2-2*x-3*y), (3-x-2*y)
  * (1-x-2*y) ], [x, y], [-4.9, 3.9], 0.01, 10, 1)
```



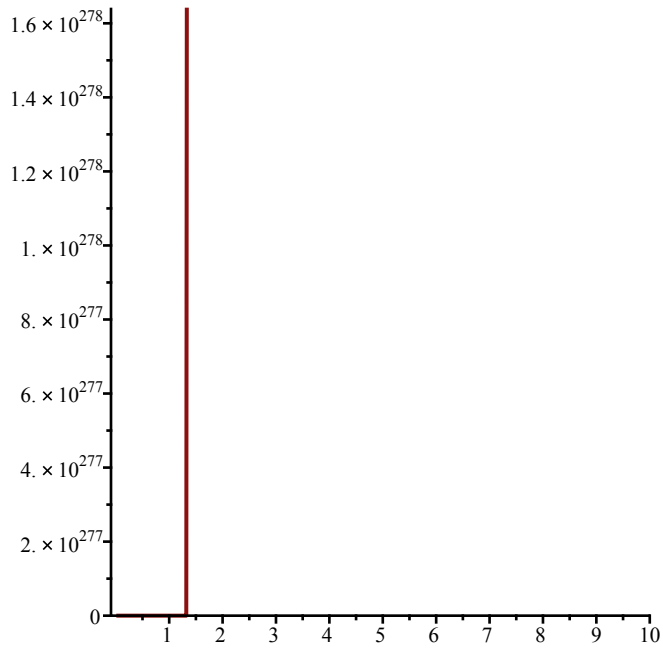
```
> #So [-5, 4] is not stable.
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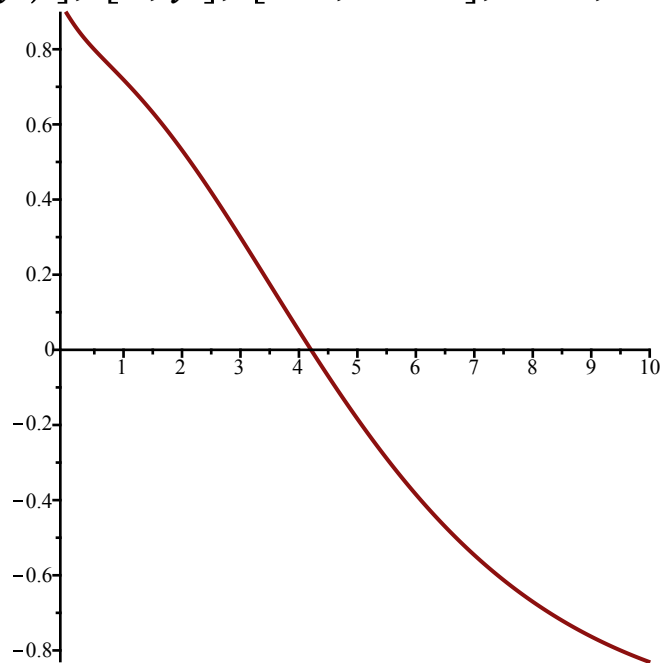
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```
> TimeSeries([ (1-2*x-3*y) * (2-2*x-3*y), (3-x-2*y)
  * (1-x-2*y) ], [x, y], [1.1, 0.1], 0.01, 10, 1)
```



```
> TimeSeries([ (1-2*x-3*y) * (2-2*x-3*y), (3-x-2*y)
  * (1-x-2*y) ], [x, y], [0.9, -0.1], 0.01, 10, 1)
```



```
> #So [1,0] is unstable.
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