```
> #Please do NOT post Homework
  #Jeton Hida, Assignment 15, October 25, 2021
  read "/Users/jeton/Desktop/Math 336/M15.txt"
> #Number 2
  #i.
> ode:=(diff(x(t),t))=(2-x(t))(2-x(t))(6-x(t))
```

$$ode := \frac{d}{dt} x(t) = 2 - x(t)(2 - x(t))(6 - x(t)) \quad (1)$$

```
> ics:=x(0)=2
```

$$ics := x(0) = 2 \quad (2)$$

```
> dsolve({ics,ode})
```

$$x(t) = 2 \quad (3)$$

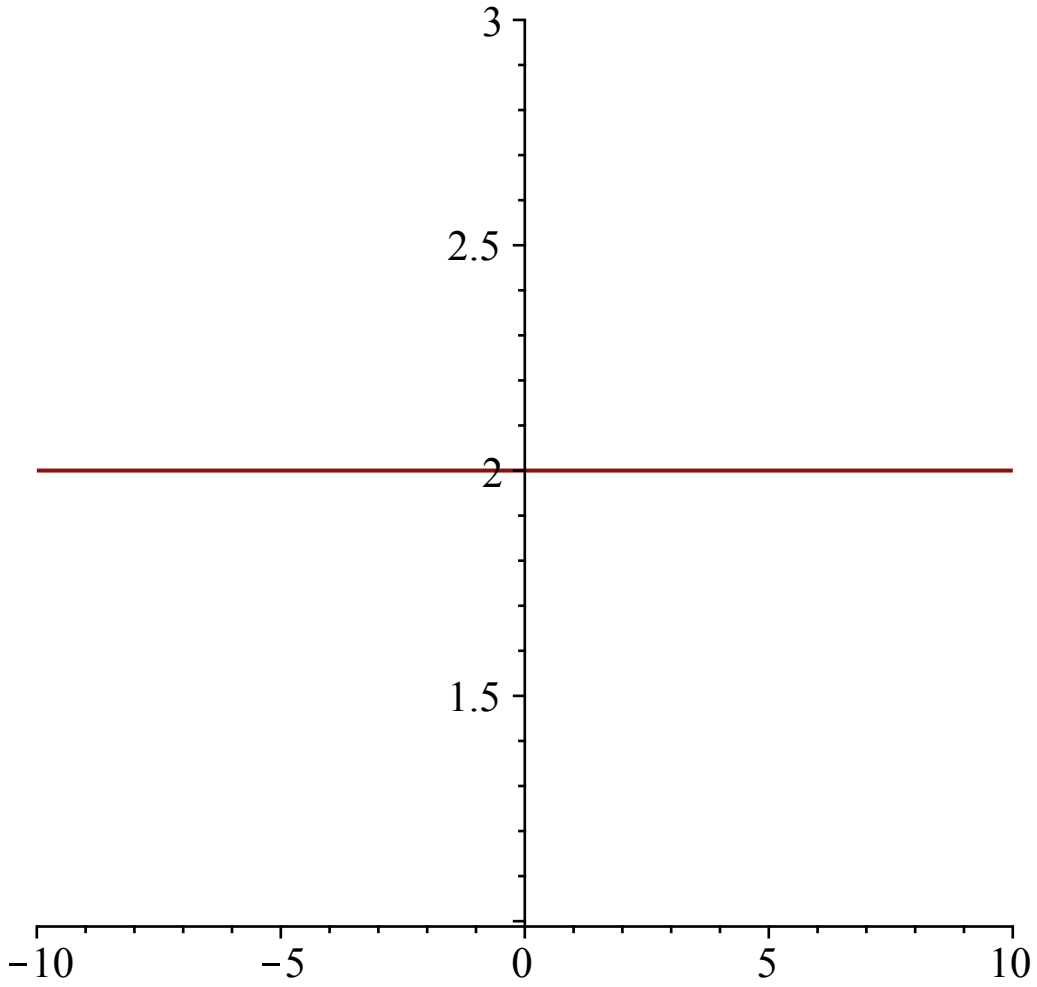
```
> ics1:=x(0)=4
```

$$ics1 := x(0) = 4 \quad (4)$$

```
> dsolve({ics1,ode})
```

$$x(t) = RootOf\left(t + \int_0^{\_Z} \frac{1}{-2 + \_a(2 - \_a)(6 - \_a)}\, d\_a - \left(\int_0^{4} \frac{1}{-2 + \_a(2 - \_a)(6 - \_a)}\, d\_a\right)\right) \quad (5)$$

```
> plot(2)
```




```
> plot(RootOf(t + Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. _Z) -
  Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. 4)), t=0..5)
```

Error, (in plot) incorrect first argument RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. 4)))

```
> #Second solution will not plot
```

```
> #ii.
```

```
> print(Dis1)
```

proc$(F, y, y0, h, A)$ **(6)**

  local L, x, i;

  $L := Orb(x + h * subs(y = x, F), x, y0, 0, \text{trunc}(A/h))$;

  $L := [seq([i * h, L[i]], i = 1 .. nops(L))]$

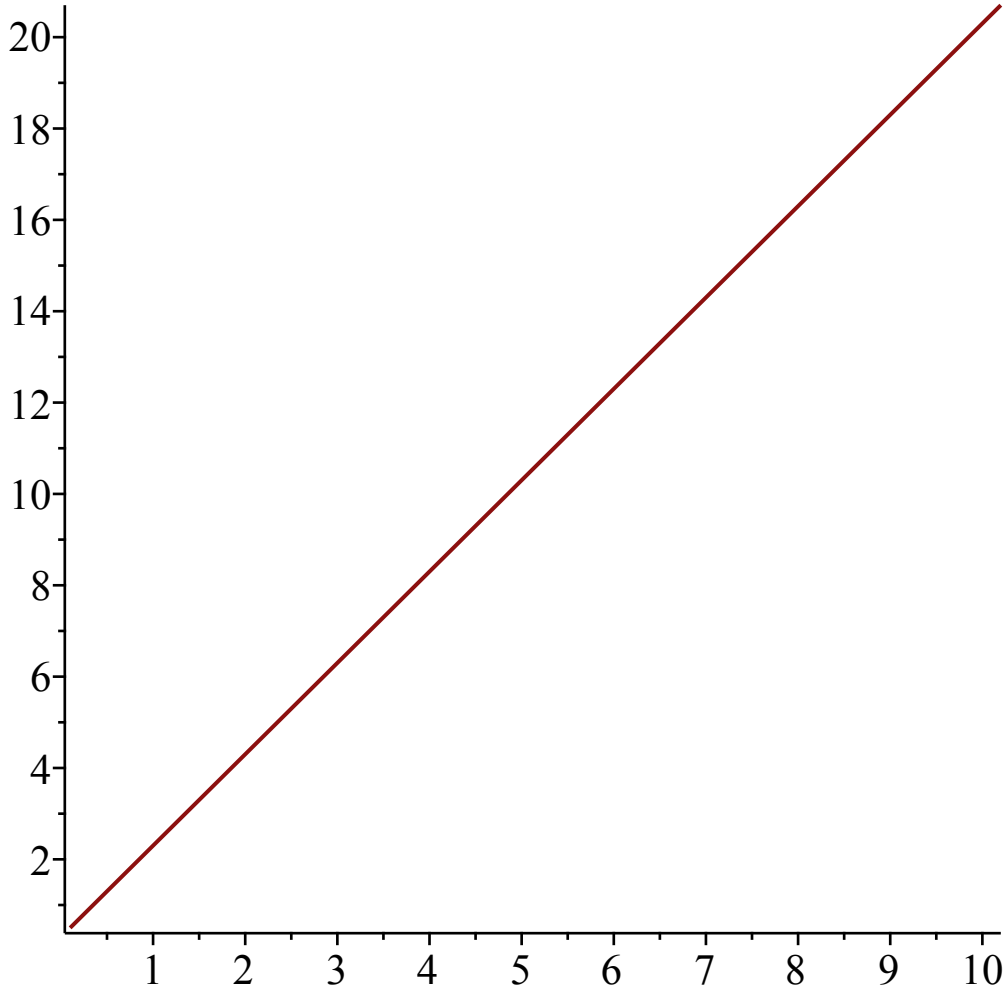
end proc

```
> L:=Dis1(2,y,.5,.1,10)
```

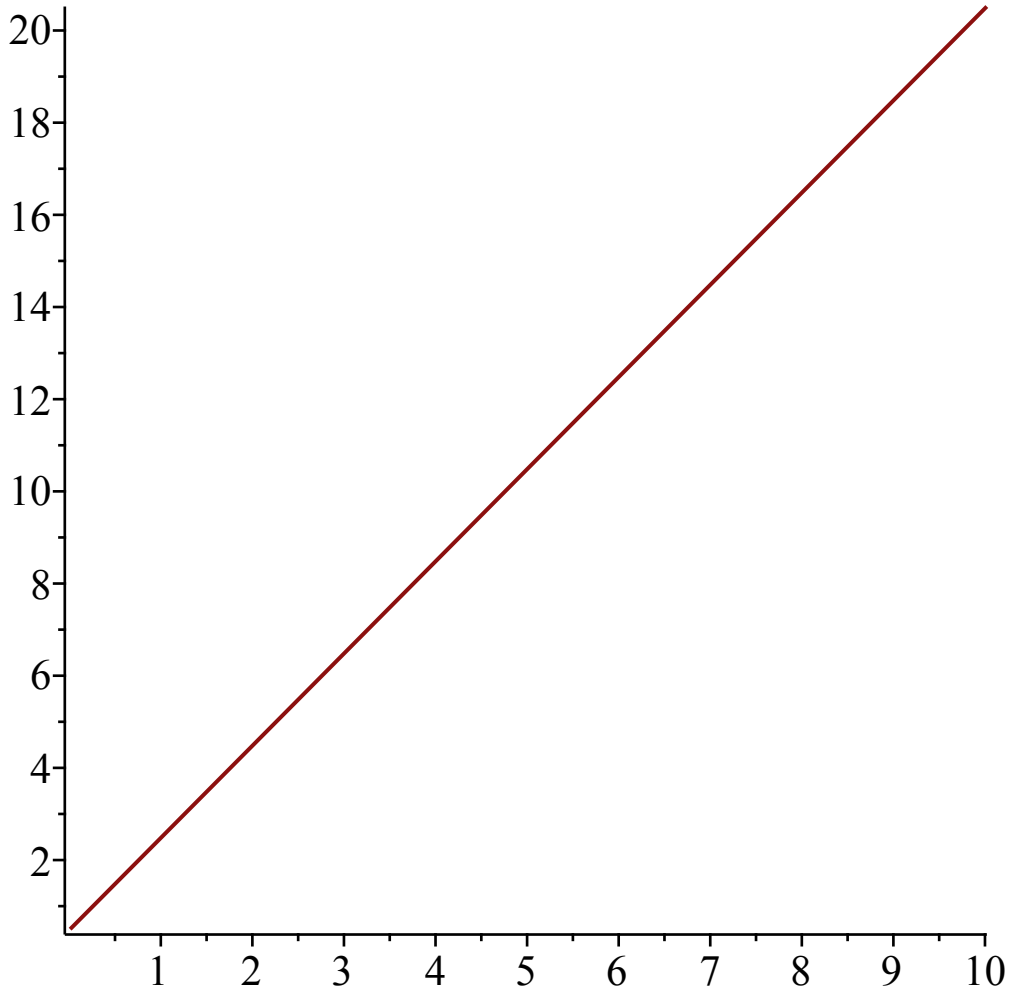
$L := [[0.1, 0.5], [0.2, 0.7], [0.3, 0.9], [0.4, 1.1], [0.5, 1.3], [0.6, 1.5], [0.7, 1.7], [0.8, 1.9],$ **(7)**
$[0.9, 2.1], [1.0, 2.3], [1.1, 2.5], [1.2, 2.7], [1.3, 2.9], [1.4, 3.1], [1.5, 3.3], [1.6, 3.5],$
$[1.7, 3.7], [1.8, 3.9], [1.9, 4.1], [2.0, 4.3], [2.1, 4.5], [2.2, 4.7], [2.3, 4.9], [2.4, 5.1],$

[2.5, 5.3], [2.6, 5.5], [2.7, 5.7], [2.8, 5.9], [2.9, 6.1], [3.0, 6.3], [3.1, 6.5], [3.2, 6.7], [3.3, 6.9], [3.4, 7.1], [3.5, 7.3], [3.6, 7.5], [3.7, 7.7], [3.8, 7.9], [3.9, 8.1], [4.0, 8.3], [4.1, 8.5], [4.2, 8.7], [4.3, 8.9], [4.4, 9.1], [4.5, 9.3], [4.6, 9.5], [4.7, 9.7], [4.8, 9.9], [4.9, 10.1], [5.0, 10.3], [5.1, 10.5], [5.2, 10.7], [5.3, 10.9], [5.4, 11.1], [5.5, 11.3], [5.6, 11.5], [5.7, 11.7], [5.8, 11.9], [5.9, 12.1], [6.0, 12.3], [6.1, 12.5], [6.2, 12.7], [6.3, 12.9], [6.4, 13.1], [6.5, 13.3], [6.6, 13.5], [6.7, 13.7], [6.8, 13.9], [6.9, 14.1], [7.0, 14.3], [7.1, 14.5], [7.2, 14.7], [7.3, 14.9], [7.4, 15.1], [7.5, 15.3], [7.6, 15.5], [7.7, 15.7], [7.8, 15.9], [7.9, 16.1], [8.0, 16.3], [8.1, 16.5], [8.2, 16.7], [8.3, 16.9], [8.4, 17.1], [8.5, 17.3], [8.6, 17.5], [8.7, 17.7], [8.8, 17.9], [8.9, 18.1], [9.0, 18.3], [9.1, 18.5], [9.2, 18.7], [9.3, 18.9], [9.4, 19.1], [9.5, 19.3], [9.6, 19.5], [9.7, 19.7], [9.8, 19.9], [9.9, 20.1], [10.0, 20.3], [10.1, 20.5], [10.2, 20.7]]

```
> plot(L)
```




```
> L:=Dis1(2,y,.5,.01,10):
> plot(L)
```




```
> L:=Dis1(RootOf(t + Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. _Z) -
  Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. 4)),y,.5,.1,10):
> Plot(L)
Error, (in Plot) Plot([[.1, .5], [.2, .5+.1*RootOf(t+Int(1/(-2+(_a
(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0
.. 4)))], [.3, .5+.2*RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0
.. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. 4)))], [.4, .5+.3*
RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a
(2-_a))(6-_a)), _a = 0 .. 4)))], [.5, .5+.4*RootOf(t+Int(1/(-2+(_a
(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0
.. 4)))], [.6, .5+.5*RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0
.. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. 4)))], [.7, .5+. ..
. (6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 ..
4)))]]) is not a valid command; see the plot help page
> L:=Dis1(RootOf(t + Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. _Z) -
  Int(1/(-2 + _a(2 - _a)(6 - _a)), _a = 0 .. 4)),y,.5,.01,10):
> Plot(L)
Error, (in Plot) Plot([[0.1e-1, .5], [0.2e-1, .5+0.1e-1*RootOf(t+
Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6
-_a)), _a = 0 .. 4)))], [0.3e-1, .5+0.2e-1*RootOf(t+Int(1/(-2+(_a
(2-_a))(6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0
.. 4)))], [0.4e-1, .5+0.3e-1*RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)),
_a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. 4)))],
[0.5e-1, .5+0.4e-1*RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 ..
_Z)-(Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. 4)))], [0.6e-1,
```

3. i. $$x(n) = \frac{x(n-1) + 2x(n-2) + 3x(n-3) + 11x(n-4)}{x(n-1) + x(n-3)}$$

$x(0) = 1,\ x(1) = 5,\ x(2) = 5,\ x(3) = 2$

$$x_1(n) = f(x_1(n-1), x_1(n-2), x_1(n-3), x_1(n-4))$$

$$x_2(n) = x_1(n-1)$$
$$x_3(n) = x_1(n-2)$$
$$x_4(n) = x_1(n-3)$$

$$x_1(n) = f(x_1(n-1), x_2(n-1), x_3(n-1), x_4(n-1))$$

$$x_1(n) = \frac{x_1(n-1) + 2x_2(n-1) + 3x_3(n-1) + 11x_4(n-1)}{x_1(n-1) + x_3(n-1)}$$

```
.5+0.5e-1*RootOf(t+Int(1/(-2+(_a(2-_a))(6-_a)), _a = 0 .. _Z)-(Int
(1/(-2+( ... (6-_a)), _a = 0 .. _Z)-(Int(1/(-2+(_a(2-_a))(6-_a)),
_a = 0 .. 4)))]]) is not a valid command; see the plot help page
```

```
> #Number 3
```

```
> #i. found it attached in PDF
> #ii.
```

```
> print(ToSys)
```

$$\mathbf{proc}(k, z, f, INI)\ \mathbf{local}\ i;\ [f, seq(z[i-1], i=2..k)]\ \mathbf{end\ proc} \tag{8}$$

```
> ToSys(4,z,(z[1]+2*z[2]+3*z[3]+11*z[4])/(z[1]+z[3]),[1,5,5,2])
```

$$\left[\frac{z_1 + 2\,z_2 + 3\,z_3 + 11\,z_4}{z_1 + z_3}, z_1, z_2, z_3\right] \tag{9}$$

```
> #Number 4
```

```
> print(Orbk)
```

$$\begin{aligned}
&\mathbf{proc}(k, z, f, INI, K1, K2) \\
&\quad \mathbf{local}\ L, i, newguy; \\
&\quad L := INI; \\
&\quad \mathbf{if\ not}\ (type(k, integer)\ \mathbf{and}\ type(z, symbol)\ \mathbf{and}\ type(INI, list)\ \mathbf{and}\ nops(INI) = k\ \mathbf{and} \\
&\quad type(K1, integer)\ \mathbf{and}\ type(K2, integer)\ \mathbf{and}\ 0 < K1\ \mathbf{and}\ K1 < K2)\ \mathbf{then} \\
&\qquad print(bad\ input);\ RETURN(FAIL) \\
&\quad \mathbf{end\ if}; \\
&\quad \mathbf{while}\ nops(L) < K2\ \mathbf{do} \\
&\qquad newguy := subs(\{seq(z[i] = L[-i], i = 1..k)\}, f);\ L := [op(L), newguy] \\
&\quad \mathbf{end\ do}; \\
&\quad [op(K1..K2, L)] \\
&\mathbf{end\ proc}
\end{aligned} \tag{10}$$

```
> Orbk(2,z,(1-z[1])*(1-z[2]),[2.5,2.7],1000,1010)
```

$$[0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660, 0.3819660] \tag{11}$$

```
> Digits:=7
```

$$Digits := 7 \tag{12}$$

```
> F:=ToSys(2,z,(1-z[1])*(1-z[2]),[2.5,2.7])
```

$$F := [(1 - z_1)\,(1 - z_2), z_1] \tag{13}$$

```
> SFP2(F,z[1],z[2])
```

$$[[0.3819660, 0.3819660]] \tag{14}$$

```
> #Number 5
```

Mother(Rows) Father (Columns)	AA (Frequency u)	Aa (Frequency v)	aa (Frequency w)
AA (Frequency u)	u^2	uv	uw
Aa (Frequency v)	uv	v^2	vw
aa (Frequency w)	uw	vw	w^2

3.1 Mating Table

Type of Parents / Offspring Genotype Frequencies	AA	Aa	aa
AA x AA (u^2)	u^2	0	0
AA x Aa (2uv)	uv	uv	0
AA x aa (2uw)	0	2uw	0
Aa x Aa (v^2)	v^2/4	v^2/2	v^2/4
Aa x aa (2vw)	0	vw	vw
aa x aa (w^2)	0	0	w^2
	u^2+uv+(v^2/4) (53a)	uv+2uw+(v^2/2)+vw (53b)	(v^2/4)+vw+w^2 (53c)

3.2 Offspring Table