```
1
2       function prey(a,b,p,pd)
3       implicit none
4       real :: prey,b,p,pd,a
5       prey = ((a*p) - (b*p*pd))
6       end
7
8
9       function predator(e,m,b,p,pd)
10      implicit none
11      real :: predator,a,b,e,m,pd,p
12      predator = (e*b*p*pd) - (m*pd)
13      end
14
15
16  Program LVmodel
17      implicit none
18      integer i,j
19      real  ::
        a,b,m,e,logp,sp1,sp2,sp3,sp4,spd1,spd2,spd3,spd4,h,t(1000000),p(1000000),pd(1000000),
        prey,predator
20      h = 0.01
21      a = 0.3
22      b = 0.01
23      m = 0.2
24      e = 0.3
25      p(1)  = 0.5
26      pd(1)  = 0.5
27      t(1) = 1
28
29
30      do i = 1,100000
31          sp1  = h*prey(a,b,p(i),pd(i))
32          sp2  = h*prey(a,b,p(i)+0.5*h*sp1,pd(i))
33          sp3  = h*prey(a,b,p(i)+0.5*h*sp2,pd(i))
34          sp4  = h*prey(a,b,p(i)+h*sp3,pd(i))
35          spd1 = h*predator(e,m,b,p(i),pd(i))
36          spd2 = h*predator(e,m,b,p(i),pd(i)+0.5*h*spd1)
37          spd3 = h*predator(e,m,b,p(i),pd(i)+0.5*h*spd2)
38          spd4 = h*predator(e,m,b,p(i),pd(i)+h*spd3)
39
40          t(i+1) = t(i) + 1
41          p(i+1)  = p(i)  + (sp1  + 2*sp2  + 2*sp3  + sp4)/6
42          pd(i+1) = pd(i) + (spd1 + 2*spd2 + 2*spd3 + spd4)/6
43      enddo
44
45
46      open (unit=10, file='prey1.txt', status='old')
47      do i = 1,100000
48          write (10,*) t(i), p(i)
49      enddo
50      close (10)
51
52
53      open (unit=12, file='predator1.txt', status='old')
54      do i = 1,100000
55          write (12,*) t(i), pd(i)
56      enddo
57      close (12)
58
59
60      open (unit=22, file='pdp1.txt', status='old')
61      do i = 1,100000
62          write (22,*) p(i), pd(i)
63      enddo
64      close (22)
65
66      open (unit=24, file='logp1.txt', status='old')
67      do i = 1,100000
```

```
68          write (24,*) t(i),log(p(i))
69      enddo
70      close (24)
71
72      open (unit=26, file='logpd1.txt', status='old')
73      do i = 1,100000
74          write (26,*) t(i),log(pd(i))
75      enddo
76      close (26)
77
78      end
79
80
81
82
83
84
85
```

```
1
2       function prey(a,b,k,p,pd)
3       implicit none
4       real :: prey,b,p,pd,a,k
5       prey = a*p*(1-p/k) - b*p*pd
6       end
7
8
9       function predator(e,m,b,p,pd)
10      implicit none
11      real :: predator,a,b,e,m,pd,p
12      predator = e*b*p*pd - m*pd
13      end
14
15
16  Program LVmodel
17      implicit none
18      integer i,j
19      real  ::
        a,b,k,m,e,sp1,sp2,sp3,sp4,spd1,spd2,spd3,spd4,h,t(1000000),p(1000000),pd(1000000),pre
        y,predator
20      h = 0.1
21      a = 0.2
22      b = 0.3
23      m = 0.1
24      e = 1
25      k = 20
26      p(1)  = 0.5
27      pd(1)  = 0.5
28      t(1) = 1
29
30
31      do i = 1,100000
32          sp1  = h*prey(a,b,k,p(i),pd(i))
33          sp2  = h*prey(a,b,k,p(i)+0.5*h*sp1,pd(i))
34          sp3  = h*prey(a,b,k,p(i)+0.5*h*sp2,pd(i))
35          sp4  = h*prey(a,b,k,p(i)+h*sp3,pd(i))
36          spd1 = h*predator(e,m,b,p(i),pd(i))
37          spd2 = h*predator(e,m,b,p(i),pd(i)+0.5*h*spd1)
38          spd3 = h*predator(e,m,b,p(i),pd(i)+0.5*h*spd2)
39          spd4 = h*predator(e,m,b,p(i),pd(i)+h*spd3)
40
41          t(i+1) = t(i) + 1
42          p(i+1)  = p(i)  + (sp1  + 2*sp2  + 2*sp3  + sp4)/6
43          pd(i+1) = pd(i) + (spd1 + 2*spd2 + 2*spd3 + spd4)/6
44      enddo
45
46
47      open (unit=14, file='prey2.txt', status='old')
48      do i = 1,100000
49          write (14,*) t(i), p(i)
50      enddo
51      close (14)
52
53
54      open (unit=16, file='predator2.txt', status='old')
55      do i = 1,100000
56          write (16,*) t(i), pd(i)
57      enddo
58      close (16)
59
60
61      open (unit=22, file='pdp2.txt', status='old')
62      do i = 1,100000
63          write (22,*) p(i),pd(i)
64      enddo
65      close (22)
66
67
```

```
68        end
69
70
71
72
73
74
75
```

```
1
2       function prey(a,b,k,th,p,pd)
3       implicit none
4       real :: prey,b,p,pd,a,k,th
5       prey = a*p*(1-(p/k)) - (b*p*pd)/(1+(b*p*th))
6       end
7
8
9       function predator(m,k,p,pd)
10      implicit none
11      real :: predator,k,m,pd,p
12      predator = (m*pd)*(1-(pd/(k*p)))
13      end
14
15
16  Program LVmodel
17      implicit none
18      integer i,j
19      real  ::
        a,b,k,th,m,sp1,sp2,sp3,sp4,spd1,spd2,spd3,spd4,h,t(1000000),p(1000000),pd(1000000),pr
        ey,predator
20      h = 0.01
21      a = 0.2
22      b = 0.01
23      m = 0.1
24      k = 500
25      th= 0.2
26      p(1)  = 0.01
27      pd(1) = 0.01
28      t(1) = 1
29
30
31      do i = 1,100000
32          sp1  = h*prey(a,b,k,th,p(i),pd(i))
33          sp2  = h*prey(a,b,k,th,p(i)+0.5*h*sp1,pd(i))
34          sp3  = h*prey(a,b,k,th,p(i)+0.5*h*sp2,pd(i))
35          sp4  = h*prey(a,b,k,th,p(i)+h*sp3,pd(i))
36          spd1 = h*predator(m,k,p(i),pd(i))
37          spd2 = h*predator(m,k,p(i),pd(i)+0.5*h*spd1)
38          spd3 = h*predator(m,k,p(i),pd(i)+0.5*h*spd2)
39          spd4 = h*predator(m,k,p(i),pd(i)+h*spd3)
40
41          t(i+1) = t(i) + 1
42          p(i+1)  = p(i)  + (sp1  + 2*sp2  + 2*sp3  + sp4)/6
43          pd(i+1) = pd(i) + (spd1 + 2*spd2 + 2*spd3 + spd4)/6
44      enddo
45
46
47      open (unit=18, file='prey3.txt', status='old')
48      do i = 1,100000
49          write (18,*) t(i), p(i)
50      enddo
51      close (18)
52
53
54      open (unit=20, file='predator3.txt', status='old')
55      do i = 1,100000
56          write (20,*) t(i), pd(i)
57      enddo
58      close (20)
59
60
61      open (unit=22, file='pdp3.txt', status='old')
62      do i = 1,100000
63          write (22,*) p(i), pd(i)
64      enddo
65      close (22)
66
67
```

```
68        end
69
70
71
72
73
74
75
```