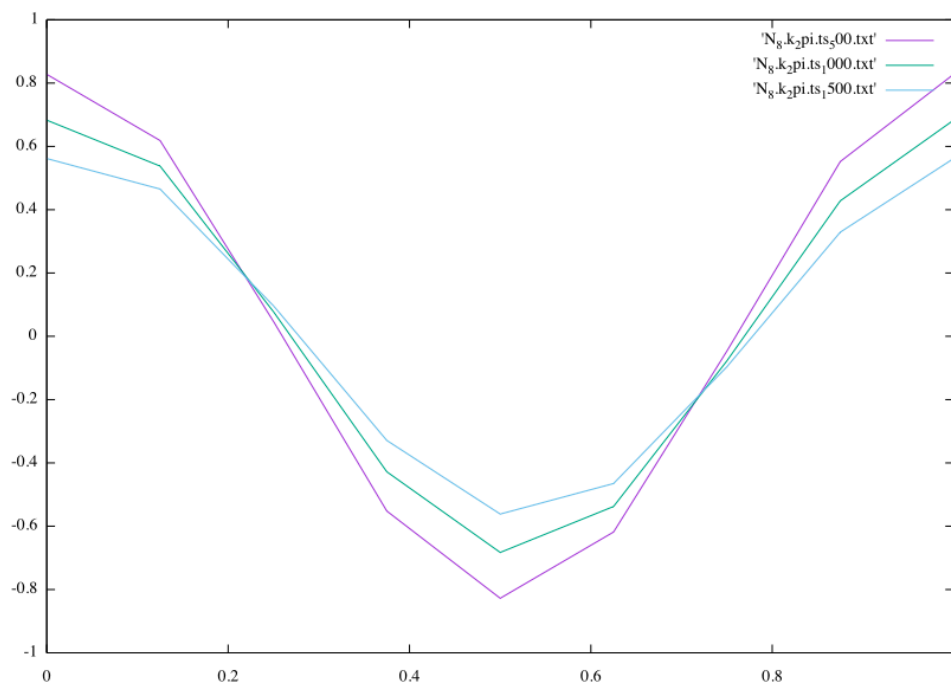


08-153031

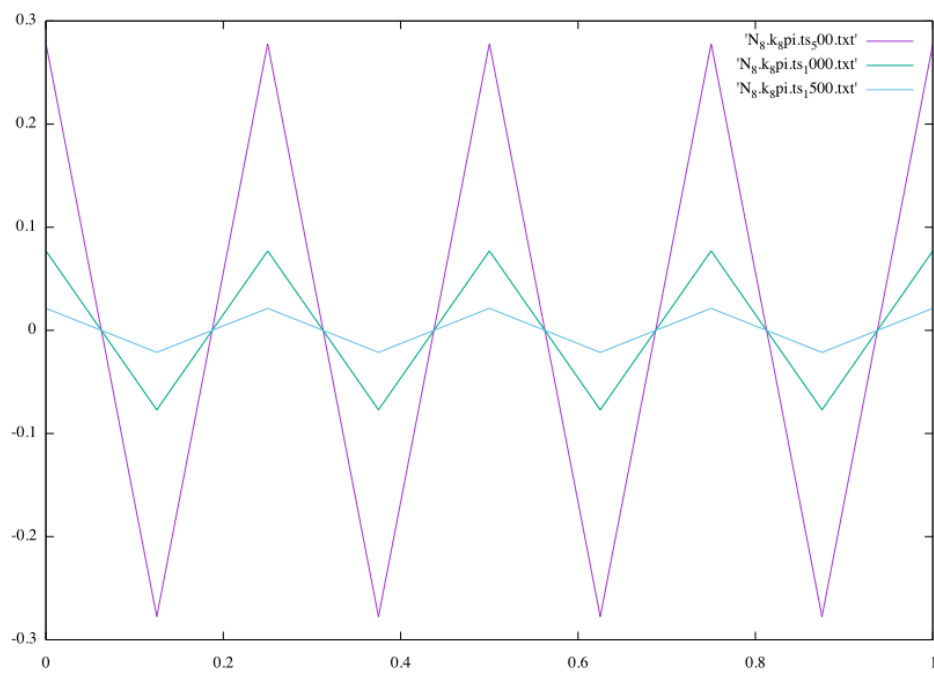
教養学部統合自然科学科統合生命コース3年 木戸口 航

結果

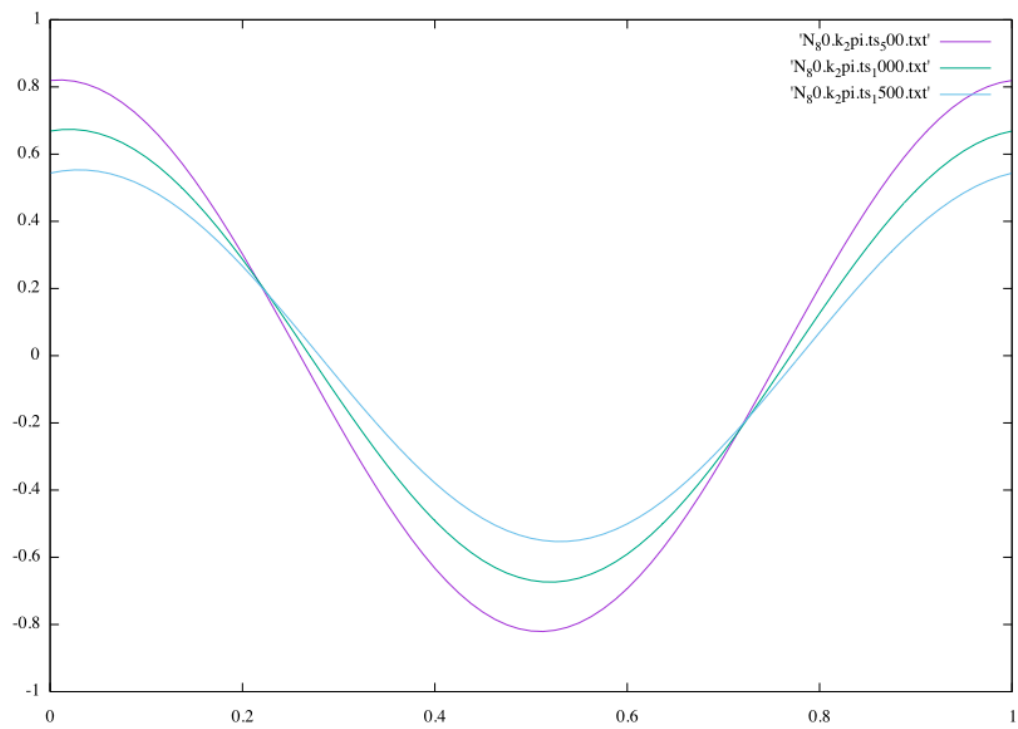
$x=0.125, k=2\pi$



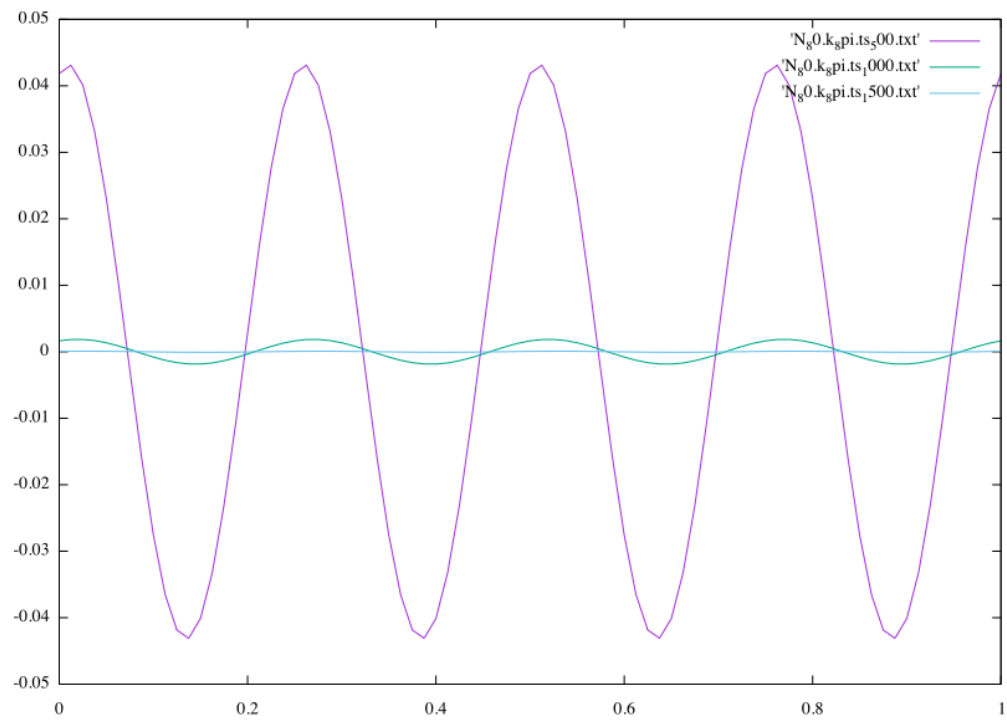
$x=0.125, k=8\pi$



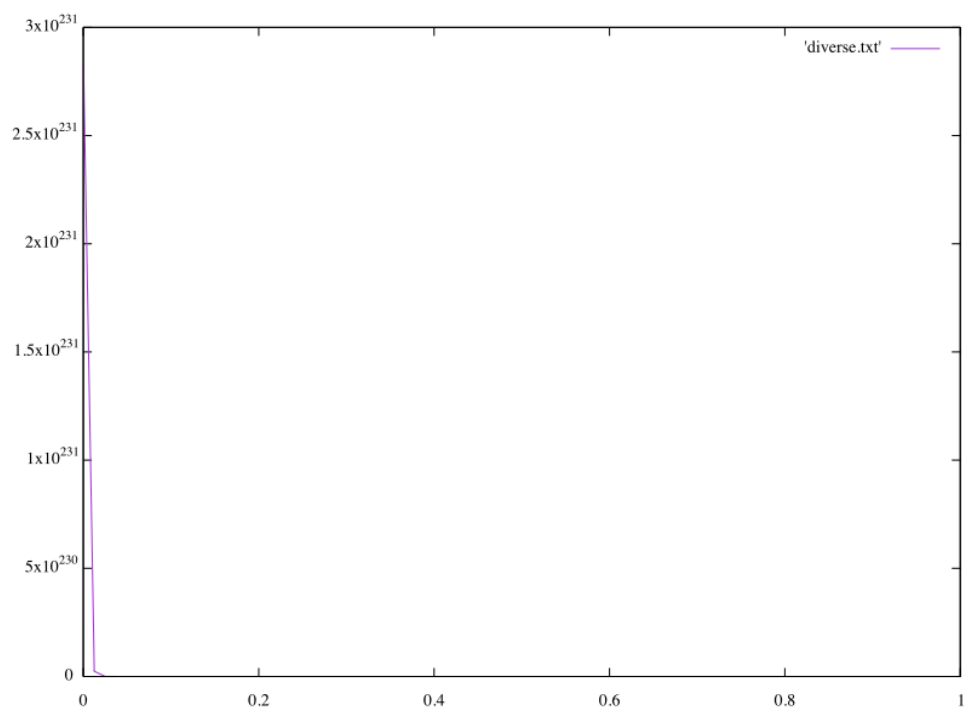
$x=0.0125$, $k=2\pi$



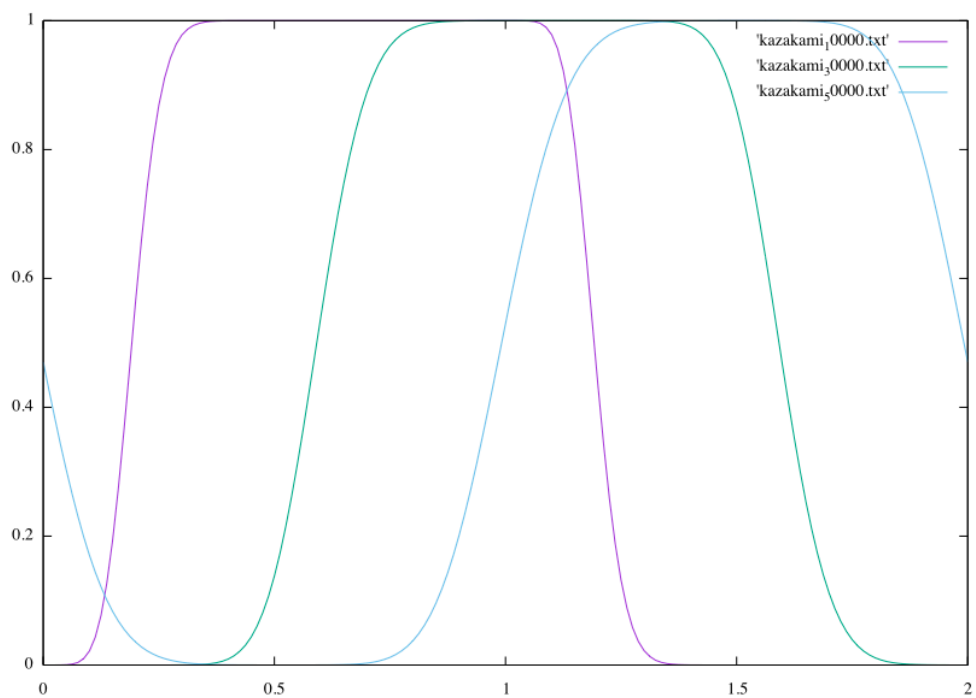
$x=0.0125$, $k=8\pi$



$x=0.0125$, $k=2\pi$, $\kappa=0$, 中央差分



$x=0.0125$, $k=2\pi$, $\kappa=0$, 風上



考察

メッシュが粗い、または波長が短いと移流が観察しづらい

ソースコード

(1)

```
1  #include <stdio.h>
2  #include <math.h>
3
4  #define N 80
5  #define L 1.0
6  #define j 1.0
7  #define u 2.0
8  #define PI 3.1415926535897932384626
9  #define A 1.0
10 #define timestep 50000
11 #define k 0
12
13 int main() {
14     double x[3*N+2],
15            f[3*N+2],
16            fn[3*N+2],
17            dx = (double) 1.0/N,
18            dt = 0.00001;
19     int i,
20         n;
21
22
23     for(i=0; i<=3*N+1; i++) {
24         x[i] = (double) dx*i;
25     }
26
27     //初期条件の設定
28     for (i=0; i<N; i++) {
29         f[i] = 1;
30     }
31
32     for (i=N; i<2*N-1; i++) {
33         f[i] = 0;
34     }
35
36     for (i=2*N; i<3*N-1; i++) {
37         f[i] = 1;
38     }
39
40     //ステップを進めていく
41     for (n=0; n<timestep; n++) {
42
43         for (i=1; i<=3*N; i++) {
44             fn[i] = f[i] + (k / (dx*dx)) * (f[i+1] - 2.0*f[i] + f[i-1]) - u / (dx) * (f[i] - f[i-1]) * dt;
45         }
46         fn[0] = f[2*N] + (k / (dx*dx)) * (f[2*N+1] - 2.0*f[2*N] + f[2*N-1]) - u / (2*dx) * (f[2*N+1] - f[2*N-1]) * dt; //fn[2L]
47
48         for (i=0; i<=3*N+1; i++) {
49             f[i] = fn[i];
50         }
51     }
52
53
54     for (i=0; i<=2*N; i++) {
55         printf("%f %f\n", x[i], fn[i]);
56     }
57 }
58 }
```

(2)

```
1 #include <stdio.h>
2 #include <math.h>
3
4 #define N 80
5 #define L 1.0
6 #define j 1.0
7 #define u 2.0
8 #define PI 3.1415926535897932384626
9 #define A 1.0
10 #define timestep 500
11 #define k 0
12
13 int main() {
14     double x[3*N+2],
15            f[3*N+2],
16            fn[3*N+2],
17            dx = (double) 1.0/N,
18            dt = 0.00001;
19     int i,
20         n;
21
22     for(i=0; i<=3*N+1; i++) {
23         x[i] = (double) dx*i;
24     }
25
26     //初期条件の設定
27     for (i=0; i<N-1; i++) {
28         f[i] = 1;
29     }
30
31     for (i=N-1; i<2*N-1; i++) {
32         f[i] = 0;
33     }
34     f[2*N-1] = 1;
35
36     //ステップを進めていく
37     for (n=0; n<timestep; n++) {
38         for (i=1; i<=3*N; i++) {
39             fn[i] = f[i] + (k / (dx*dx)) * (f[i+1] - 2.0*f[i] + f[i-1]) - u / (2*dx) * (f[i+1] - f[i-1])) * dt;
40         }
41         fn[0] = f[2*N] + (k / (dx*dx)) * (f[2*N+1] - 2.0*f[2*N] + f[2*N-1]) - u / (2*dx) * (f[2*N+1] - f[2*N-1])) * dt; //fn[2L]
42         for (i=0; i<=3*N+1; i++) {
43             f[i] = fn[i];
44         }
45     }
46
47     for (i=0; i<=N; i++) {
48         printf("%f %f\n", x[i], fn[i]);
49     }
50 }
```

(3)

```
1 #include <stdio.h>
2 #include <math.h>
3
4 #define N 80 //変数
5 #define L 1.0
6 #define j 4.0
7 #define u 2.0 //変数
8 #define PI 3.1415926535897932384626
9 #define A 1.0
10 #define timestep 1500 //変数
11 #define k 1
12
13 int main() {
14     double x[3*N+2],
15            f[3*N+2],
16            fn[3*N+2],
17            dx = (double) 1.0/N,
18            dt = 0.00001;
19     int i,
20         n;
21
22     for(i=0; i<=3*N+1; i++) {
23         x[i] = (double) dx*i;
24     }
25
26     //初期条件の設定
27     for (i=0; i<=3*N+1; i++) {
28         f[i] = A * cos(2*PI*j*x[i]/L);
29     }
30
31     //ステップを進めていく
32     for (n=0; n<timestep; n++) {
33         for (i=1; i<=3*N; i++) {
34             fn[i] = f[i] + (k / (dx*dx)) * (f[i+1] - 2.0*f[i] + f[i-1]) - u / (2*dx) * (f[i+1] - f[i-1])) * dt;
35         }
36         fn[0] = f[2*N] + (k / (dx*dx)) * (f[2*N+1] - 2.0*f[2*N] + f[2*N-1]) - u / (2*dx) * (f[2*N+1] - f[2*N-1])) * dt; //fn[2L]
37         for (i=0; i<=3*N+1; i++) {
38             f[i] = fn[i];
39         }
40     }
41
42     for (i=0; i<=N; i++) {
43         printf("%f %f\n", x[i], fn[i]);
44     }
45 }
```