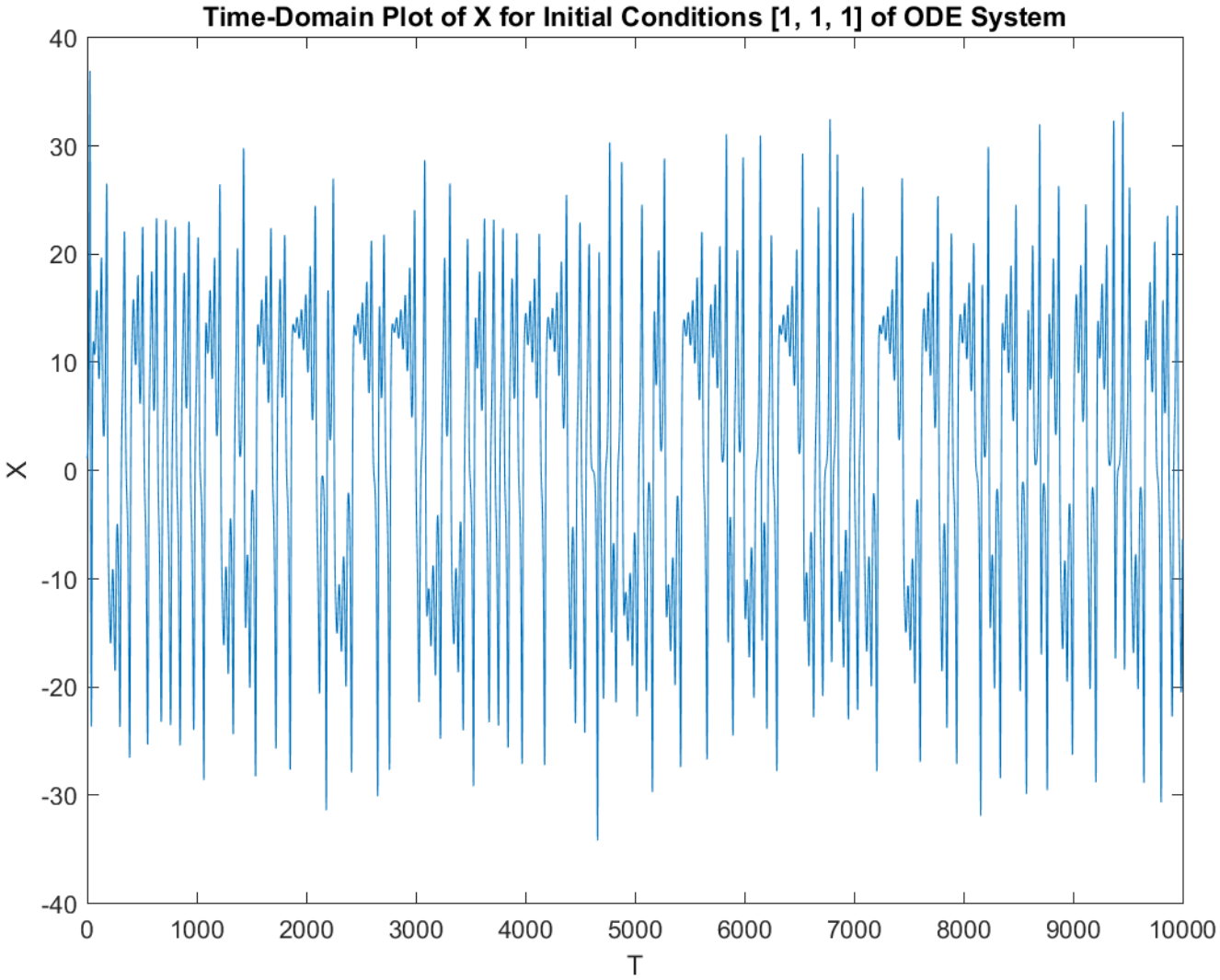
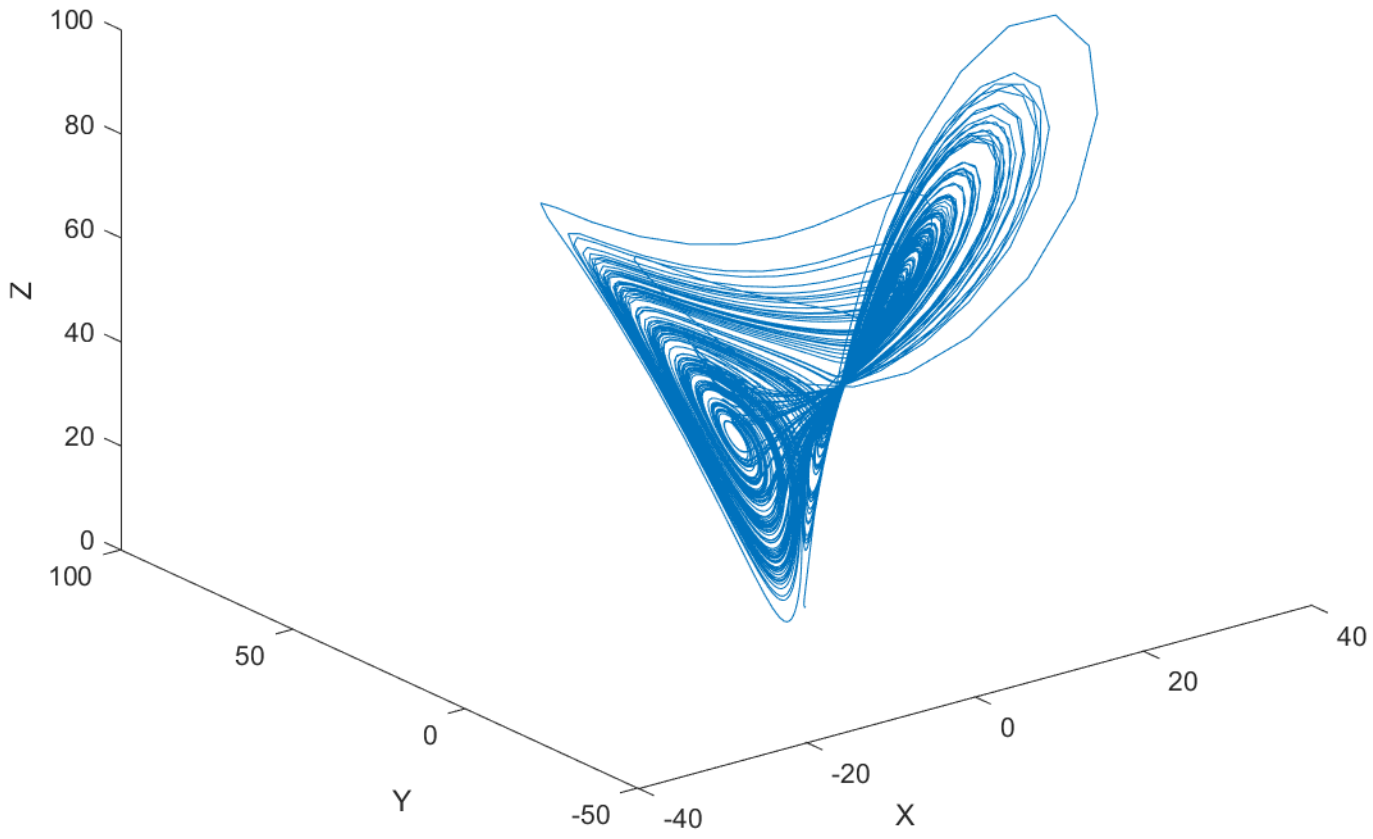
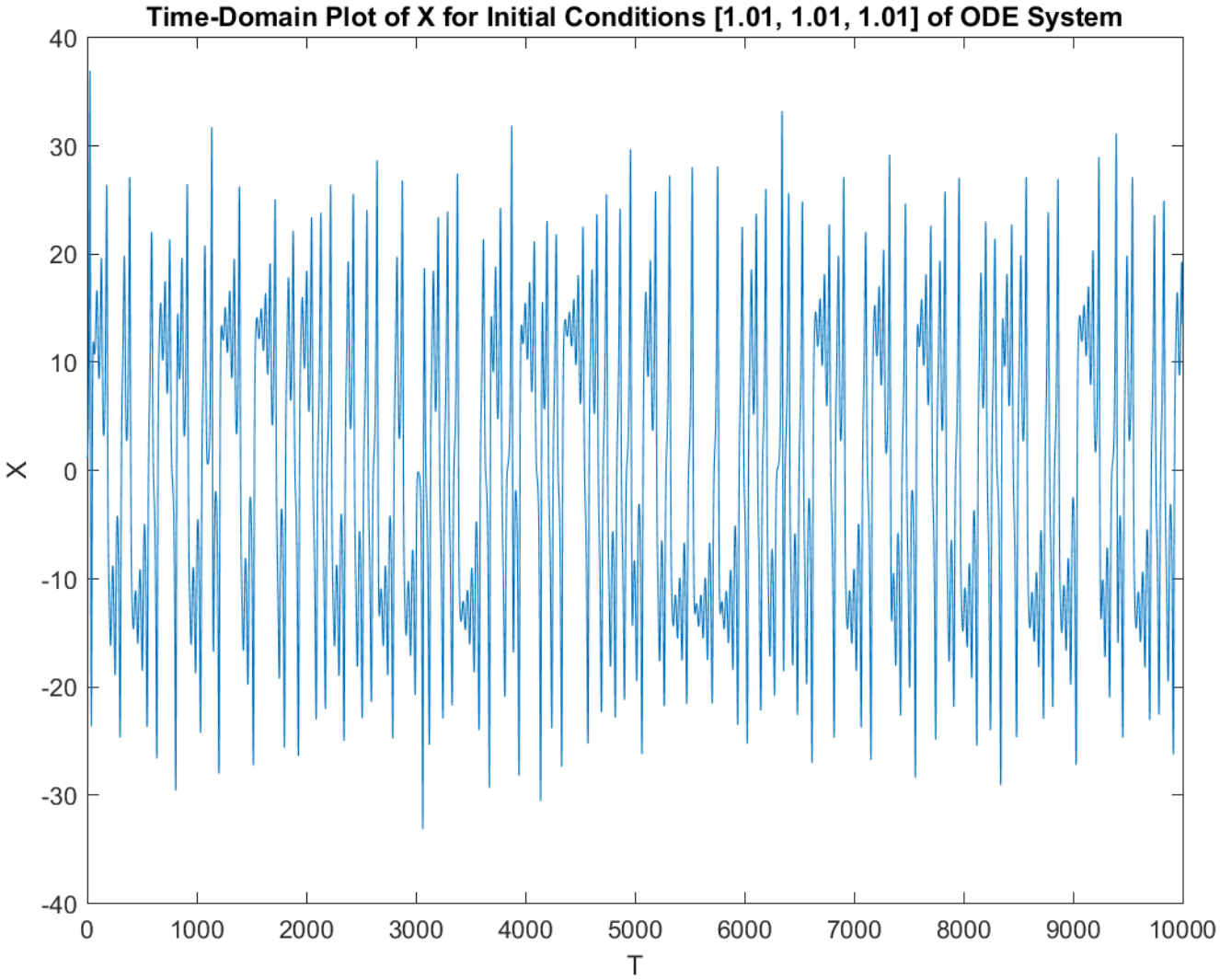
CSCI3656_ProblemSet12_4.m

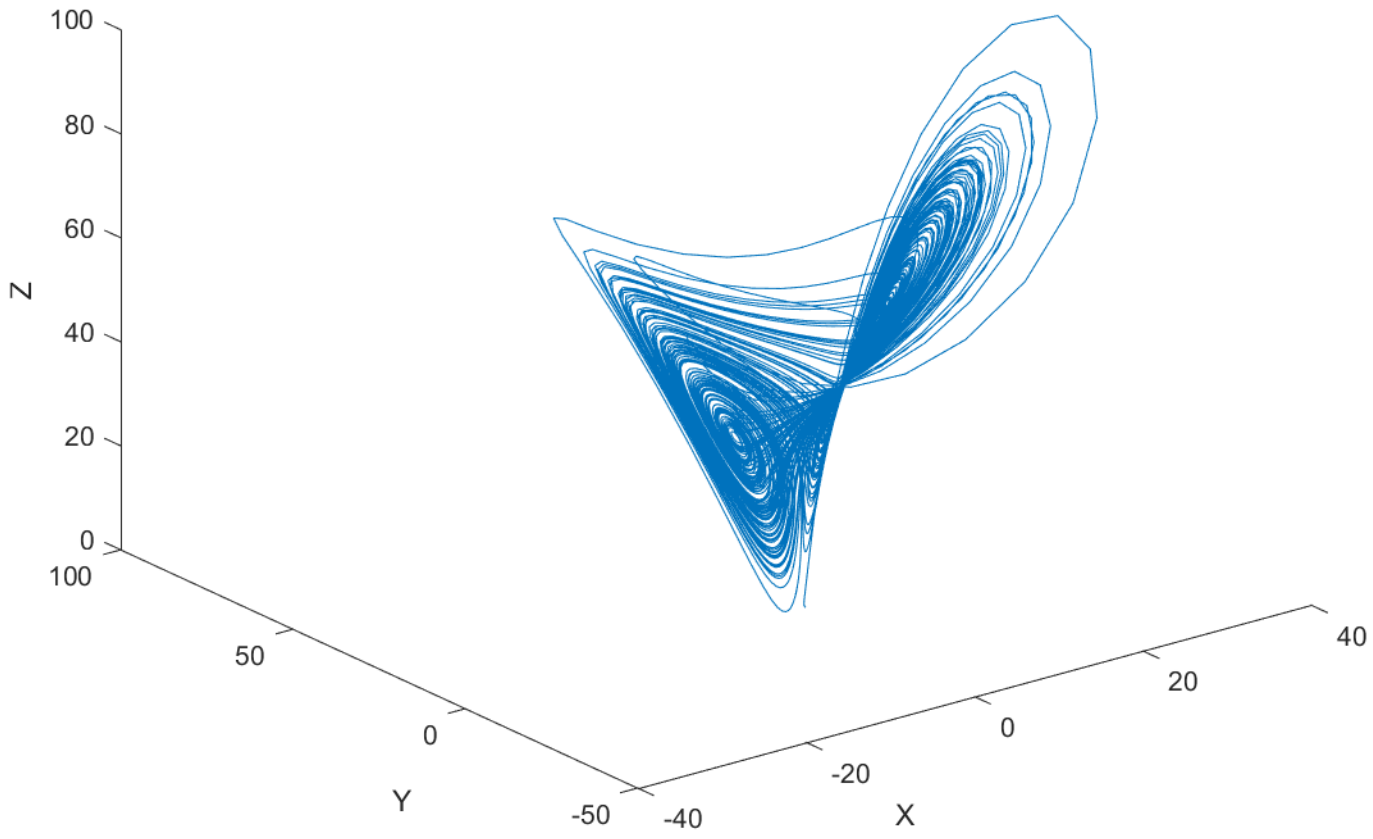
```
function [ output ] = CSCI3656_ProblemSet12_4( initCond, h, N )

output = [];

for i = 1 : N
    % Vector [x, y, z]^T set into values
    x = initCond(1, 1);
    y = initCond(2, 1);
    z = initCond(3, 1);

    % ODE System Equations
    xDot = 16 * (y - x);
    yDot = 45*x - y - x*z;
    zDot = x*y - 4*z;

    % 3D Slope into Array
    slopePlane = [xDot; yDot; zDot];

    % Setting up for next recursion
    newCond = initCond + h * slopePlane;
    output = [output, newCond];
    initCond = newCond;
end
```

```
>> CSCI3656_ProblemSet12_4( [1; 1; 1], 0.01, 10000 )

ans =

             1                    1.0688                  1.194752
1.37291879936          1.60313473930118
          1.43                     1.856               2.308294496
2.81176842399238          3.38886087839876
          0.97                    0.9455               0.927516928
0.91799464553685         0.919878157002836
...
        Columns 9997 through 10000

         -10.8066739580643         -9.20543212249603         -7.73217974718254
   -6.41609313894622
         -0.798912485762489       0.00239522321327579         0.493361554294474
     0.7451465960094
          52.3410060042215          50.3337016315992          48.3201330756882
    46.3491801504791

>> transpose(ans)
>> plot(ans(:,1));
>> plot3(ans(:,1),ans(:,2),ans(:,3));
>> CSCI3656_ProblemSet12_4( [1.01; 1.01; 1.01], 0.01, 10000 )

ans =

          1.01                1.07947184            1.206654108784
1.38656043900511          1.61902170030823
      1.444199                1.8743610199          2.33106867266595
2.83944332214961          3.42213574872904
      0.979801                0.9551953699         0.937220754493757
0.927859860231307         0.930116063614954
...
        Columns 9997 through 10000

           17.081125973336          16.0051431729067          14.7892773624072
    13.4895117989019
          10.3562334706526          8.40598185728473          6.66574259049944
     5.1971692048634
          55.8112854008807          55.3477952700605           54.479272890605
    53.2859171349539

>> transpose(ans)
>> plot(ans(:,1));
>> plot3(ans(:,1),ans(:,2),ans(:,3));
>>
```


Time-Domain Plot of X for Initial Conditions [1, 1, 1] of ODE System
X
T
40
30
20
10
0
-10
-20
-30
-40
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000


State Space Plot: Initial Condition [1, 1, 1] for ODE System
100
80
60
40
20
0
Z
100
50
0
-50
Y
-40
-20
0
20
40
X


Time-Domain Plot of X for Initial Conditions [1.01, 1.01, 1.01] of ODE System
X
T
40
30
20
10
0
-10
-20
-30
-40
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000


State Space Plot: Initial Condition [1.01, 1.01, 1.01] for ODE System
100
80
60
40
20
0
Z
100
50
0
-50
Y
-40
-20
0
20
40
X