Approximate versus exact discretization

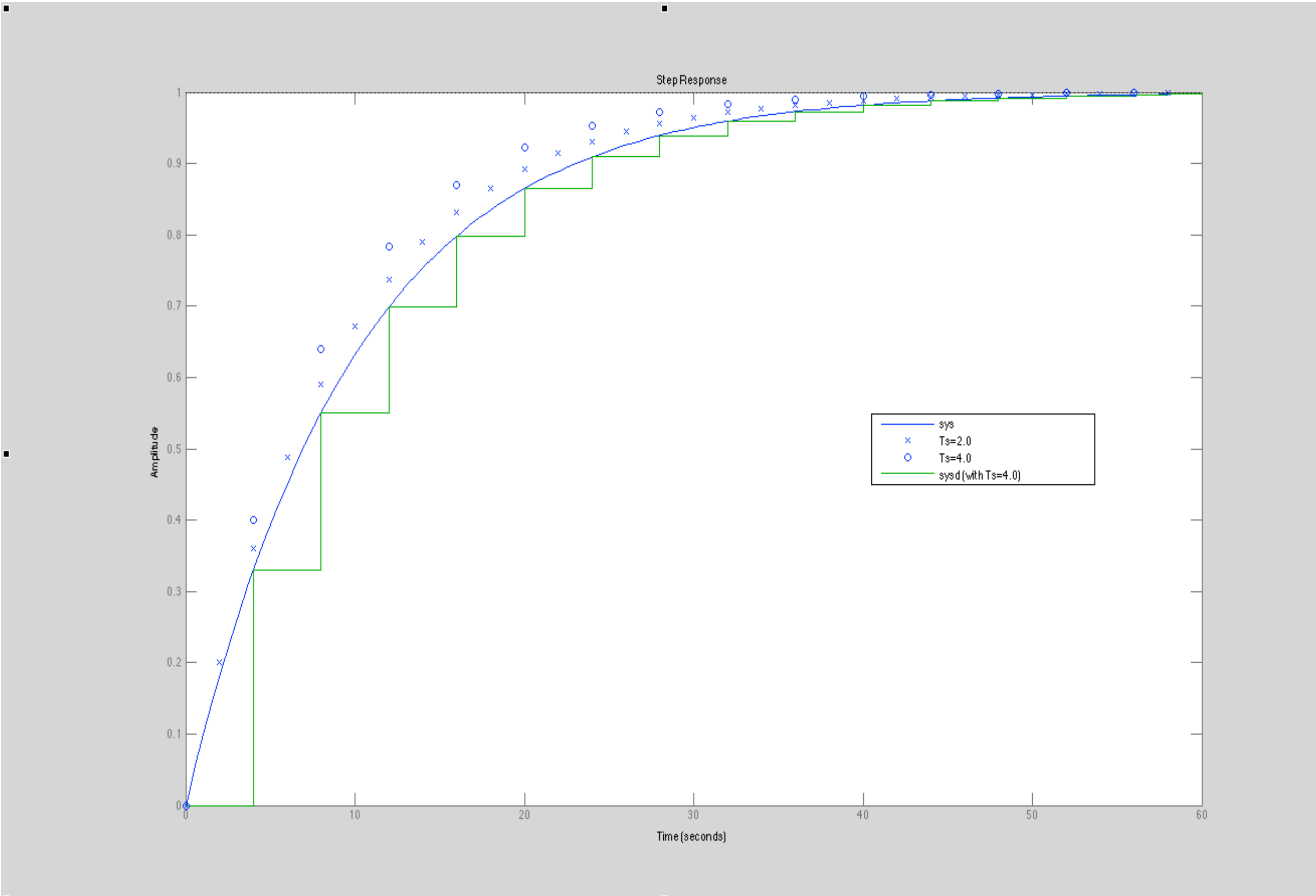
```
>> sys=tf(1,[10 1]);
>> figure; step(sys);
>> % Now simulate an approximate discrete system with Ts=2.0
```

>> % Using the Euler approximation: $\frac{\Delta t}{\tau} = 0.2 \; and \; \left(1 - \frac{\Delta t}{\tau}\right) = 0.8$

```
>> y(1)=0.0;
>> for i=1:2:60
        y(i+2)=0.8*y(i)+0.2;
    end;

>> hold on;
>> plot([0:2:59],y(1:2:60), 'x')  % to ensure that the indices line up

>> clear all;
>> y(1)=0.0;

>> % Now simulate an approximate discrete system with Ts=4.0
```

>> % Using the Euler approximation: $\frac{\Delta t}{\tau} = 0.4 \; and \; \left(1 - \frac{\Delta t}{\tau}\right) = 0.6$

```
>> for i=1:4:60
       y(i+4)=0.6*y(i)+0.4;
    end
>> plot([0:4:59],y(1:4:60), 'o')

>> sysd=c2d(sys,4);

Undefined function or variable 'sys'.
>> sys=tf(1,[10,1]);
>> sysd=c2d(sys,4);
>> step(sysd)
>>%  See figure below and notice that plot for approximate vs. exact discrete
>> system representation
```



Step Response
Amplitude
Time (seconds)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
10
20
30
40
50
60
sys
Ts=2.0
Ts=4.0
sysd (with Ts=4.0)