

### Problem 1.

Link to Github: <https://github.com/NFSudi>

### Problem 2a.

Note: Residual close to 0

### Problem 2b.

Note: The controller in 2a was improper. I added 5 roots ( $s=-20$ ) to the target  $f$ .  $x$  increased its roots from 3 to 5.  $x$  and  $y$  now have 5 roots and make  $D$  proper

### Problem 3.

```
>> opt = c2dOptions('Method','matched'); c2d(tf(ys,xs),h,opt)
```

ans =

1.046 z - 1.057

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z - 1.105

Sample time: 0.01 seconds

Discrete-time transfer function.

```
>> ys=[1 -1]; xs=[1 -10]; h=0.01; Ds=RR_tf(ys,xs); [Dz]=NFS_C2D_matched(Ds,0.01)
```

Dz =

RR\_tf with properties:

num: 0.1000 -0.1010

den: 1.0000 -1.1052

Discrete-time transfer function with h= 0.0100

m=1, n=1, n\_r=n-m=0, semiproper, K= 0.1000

z: 1.0101

Matlab has certainly more steps to them since they put into one function.

Also, we can see the numerator and denominator and roots in comparison to matlab that is only the function