ME 360 – H08 Name _____

USE THIS SHEET AS THE FIRST PAGE OF YOUR HOMEWORK SUBMISSION

1) Determine spring constant k and tensile load F_y that would cause the tension spring to yield in the body of the spring (not the hook ends). Is this a standard wire diameter?

d = 0.072 in OD = 0.619 in N_a = 22 A228 music wire

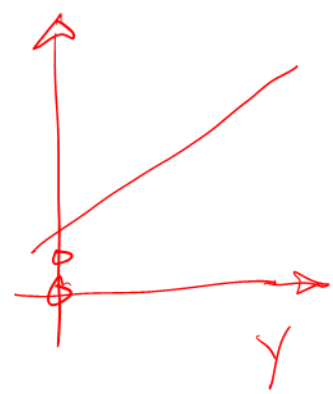
k _____ F_y _____ standard d ? YES NO (circle one)

2) Use MATLAB "polyfit" to determine spring constant k and initial pre-tension F_i based on deadweight testing of the tension spring in problem 1). Use "polyval" to provide a plot of experimental measurements and your linear fit on the same graph. Provide hardcopy of your code and plot. **Do not use Excel.**

k_{FIT} _____ F_i _____

Deadweight [lb]	Hook-to-hook length [inch]	Deflection [inch]
0	2.48	0
2.50	2.48	0
5.00	2.64	0.16
7.50	2.88	0.40
10.00	3.11	0.63
12.50	3.34	0.86
15.00	3.55	1.07
17.50	3.79	1.31
20.00	4.00	1.52
22.50	4.25	1.77
25.00	4.47	1.99
27.50	4.70	2.22
30.00	4.93	2.45
32.50	5.17	2.69
35.00	5.40	2.92
37.50	5.67	3.19
40.00	5.93	3.45

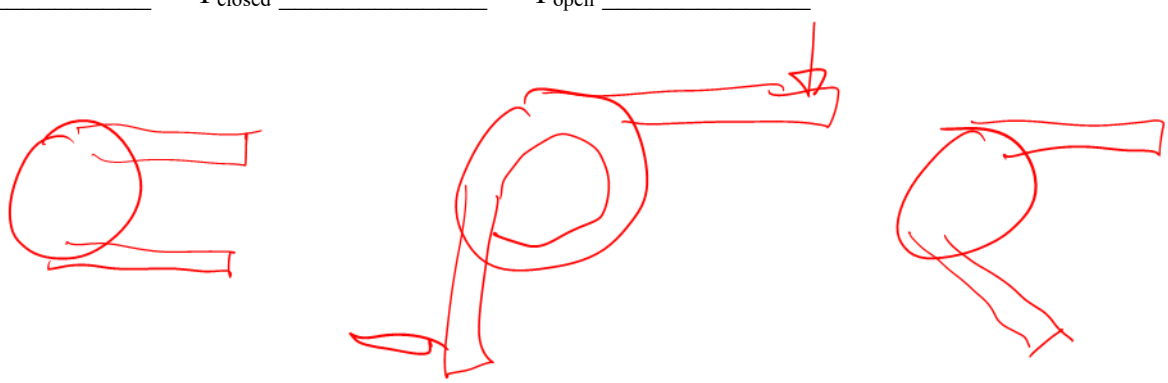
$F = ky + F_i$



3) A torsion spring is used in a hand-held spring clamp. The jaws of the clamp are 1.5 inches from the pivot. The spring angle is 45° when the clamp is closed and 0° when the clamp is open. Determine torsional spring constant, clamping force when closed and clamping force when open. Use units of torque/rev for torsional spring constant. Include leg length in N_a calculations.

d = 0.078 in OD = 0.396 in N_b = 3.25 θ_{free} = 90° music wire legs $L_1 = L_2$ = 1.5 in

k_θ _____ F_{closed} _____ F_{open} _____



EXTRA CREDIT

Natural frequency of vibration was also measured for deadweight testing in Problem 2). Determine spring constant k for each measurement. **Show your work!**

Deadweight [lb]	Time for 100 oscillations [sec]	k [lbf/inch]
20.00	43.09	
30.00	52.81	
40.00	60.86	