```matlab
1 %{
2 Aidan Chin Midterm 1 part 3 D 10/4/23
3 ECE 202 MATLAB Midterm 1
4 the goal of this script is to show that sin(3wt) is equal to 3sin(wt)
5 -4sin^3(wt)
6 %}
7
8 % *** Prepare workspace ***
9 clear % clear variables to remove chance of error
10 clf % clear figures to make the graph window clear
11
12 % *** Givens ***
13 w = input('Input value of w: '); % angular momentum in radians/second
14 tmin = -pi/w; % minimum t value
15 tmax = -1 * tmin; % maximum t value
16 N = 1000; % number of steps to be made between min and max
17 t = linspace(tmin,tmax,1+N);%create array of numbers between tmin
18                                               % and tmax
19
20 % *** Calculation ***
21 a = w.*t; % define a so avoid writing many times later
22 f1 = sin(3.*a); % given sine formula
23 f2 = 3*sin(a) - 4*sin(a).^3; % given sine subtraction formula
24
25 % *** Check ***
26 d = abs(f2) - abs(f1); % check to make sure the 2 formulas are equivalent
27 check = sum(d) % print single number check, should be close to 0
28
29 % the reason we use abs intead of soley sum is because you want to find the
30 % distance of the 2 graphs from eachother, and distance is always positive
31
32 % *** Graphing ***
33 if tmin <= -.1 %check if time values are larger than .1 to see if should be in ms
34     plot(t,f1,t,f2,':','LineWidth',3) %plot both formulas on graph with f1 being
35     %solid line, f2 being dotted and linewidth of 3
36     xlabel('Time (s)') % change x axis label
37 else
38     tms = t.*1000;
39     plot(tms,f1,tms,f2,':','LineWidth',3) %plot both formulas on graph with f1 being
40     %solid line, f2 being dotted and linewidth of 3
41     xlabel('Time (ms)') % change x axis label
42 end
43
44 title('ECE 202 Midterm 1 Part 3 D', ...
45     'Proving that sin(3wt) \equiv 3sin(wt) - 4sin^3(wt)')
46 %make title and description of figure
47 legend('f1 = sin(3wt)','f2 = 3sin(wt) - 4sin^3(wt)') % make legend for figure
48 ylabel('Angular Momentum (radians/second)')% change y axis label
49 ylim([-1.5,1.5]) % modify the y axis limits so no overlap on legend
50 grid on % enable the grid on the graph
51
```