

```
1 % Ian Woodbury
2 % 12/06/2021
3 % ECE 202 Project 1 Phase 2
4 % Project 1: Power Series Expansion of  $A\cos(\omega t)$ 
5 % Phase 2: Adding features to improve the output
6
7 clear
8
9 clf
10
11 % ----- declaring variables and early formatting -----
12
13 format shortG % Changes the format of the command line
14 n = transpose(0:2:10); % creates steps for n coefficients in the power series
15 a = (-1).^(n/2)*12.*40.^n./factorial(n); % sets up function for the a
16 % coefficients in the power series
17 coefficients = table(n, a) % creates table
18 tms = linspace(0, 200, 400); % sets time as x axis from 0(ms) to 200(ms) with 400
19 % points for plotting
20 t = tms/1000; % time in seconds
21
22 % ----- Truncated Power Series functions set up -----
23
24 f1 = a(1)*t.^n(1); % 6 functions from taylor series as specified
25 f2 = f1 + a(2)*t.^n(2);
26 f3 = f2 + a(3)*t.^n(3);
27 f4 = f3 + a(4)*t.^n(4);
28 f5 = f4 + a(5)*t.^n(5);
29 f6 = f5 + a(6)*t.^n(6);
30
31 % ----- Plotting The series -----
32
33 hold on
34 plot([0,200], [0,0], 'k', 'LineWidth', 1)
35 p1 = plot(tms, f1, tms, f2, tms, f3, tms, f4, tms, f5, 'LineWidth', 2); % plots
36 % functions 1 to 5
37 p2 = plot(tms, f6, 'LineWidth', 3); % plots functions 6
38 axis([-inf inf -15 15]) % sets up axis for x and y values
39 grid on
40 ax = gca; ax.GridAlpha = 0.5; % Makes grid darker
41 ax.FontSize = 16;
42 legend([p1; p2], "up to n = "+n, 'location', 'northeastoutside', 'FontSize', 20)
43 % creates legend for graph
44 xlabel("time t (ms)", "FontSize", 20) % label for x axis, units as ms for time
45 ylabel("f(t)", "FontSize", 20) % label for y axis, refers to all f(t)
46 % functions used above
47 title(["ECE 202: Project 1 Phase 2: Power series expansion of  $f(t) = 12\cos(40t)$ ",
48 "using truncated sums with up to 6 non-zero terms"], ...
49 "FontSize", 24)
50
51 %Design seem to be working as the graph is correct
52
```