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1 % Kavya Manchanda
2 % 11/1/2022
3 % ECE 202: Project 1 – Power Expansion Series of function of the form
4 % Acos(wt)
5 % Phase 2 : Adding features to improve the output
6
7 clear; clf;
8 format shortG;
9
10 tmin = 0;           % in ms
11 tmax = 200;         % in ms
12 N = 400;           % intervals
13
14 tms = linspace(tmin, tmax, N+1); % time array in ms
15 t = tms/1000;       % time array in s
16 n = 0:2:10;         % array of nth term
17
18 % The angular frequency in rad/s
19 an = (12.*(-1).^(n./2).*40.^n)./factorial(n);
20
21 coefTable = table(n.',an.','VariableNames',{ 'n', 'a_n'})
22
23 f1 = an(1)*t.^n(1); % first sum (ie. first term) in the power series
24 f2 = f1 + an(2)*t.^n(2); % sum of first two terms
25 f3 = f2 + an(3)*t.^n(3); % sum of first three terms
26 f4 = f3 + an(4)*t.^n(4); % sum of first four terms
27 f5 = f4 + an(5)*t.^n(5); % sum of first five terms
28 f6 = f5 + an(6)*t.^n(6); % sum of first six terms
29
30 %----- plotting the graph and its attributes -----
31 hold on
32
33 plot([0,200],[0,0], 'k', 'LineWidth', 1);
34 p1 = plot(tms,f1,tms,f2,tms,f3,tms,f4,tms,f5, 'LineWidth',2.5);
35 p2 = plot(tms,f6, 'LineWidth',5);
36 legend([p1;p2], "Up to n = " + n, "FontSize",18, "Location", "bestoutside")
37
38 ax = gca;
39 ax.GridAlpha = 0.4;
40 ax.FontSize = 16;
41 xlabel('time t (ms)', 'FontSize',18);
42 ylabel('f(t)', 'FontSize',18)
43 ylim([-15,15])
44 title(["ECE 202 Project 1 Phase 2:", ...
45       "Power series expansion of f(t)=12cos(40t) using truncated " + ...
46       "sums with up to 6 non-zero terms."], "FontSize",20)
47
48 grid on
49 hold off
```

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>> project1phase2
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```
coefTable =
```

```
6×2 table
```

n	a_n
0	12
2	-9600
4	1.28e+06
6	-6.8267e+07
8	1.9505e+09
10	-3.4675e+10

```
>>
```

ECE 202 Project 1 Phase 2:
Power series expansion of $f(t)=12\cos(40t)$ using truncated sums with up to 6 non-zero terms.

