

```
1 % Aidan Chin
2 % 12/10/23
3 % ECE 202: Project 1 phase 2
4
5 %---initialize---
6
7 format shortG
8 clear
9 clc
10
11 %---setup---
12
13 t = linspace(0,0.5,1000); % make time array t in seconds from 0s to 0.5s
14 t_ms = t*1000; % convert time t to ms from 0ms to 500ms
15
16 n = [0:2:10]; % n values of non-zero coefficients
17 a_n = (-1).^(n/2).*(20.^n)*7./factorial(n); % a_n values of non-zero coefficients
18
19 %make a table
20 T = table(n',a_n','VariableNames',{ 'n values', 'a_n values (Non-zero coefficients)'});
21
22 % ---- calculations ----
23
24 f1 = a_n(1)*t.^n(1); % First term
25 f2 = f1 + a_n(2)*t.^n(2); % 1-2 term
26 f3 = f2 + a_n(3)*t.^n(3); % 1-3 terms
27 f4 = f3 + a_n(4)*t.^n(4); % 1-4 terms
28 f5 = f4 + a_n(5)*t.^n(5); % 1-5 terms
29 f6 = f5 + a_n(6)*t.^n(6); % 1-6 terms
30
31 % ---- plotting ----
32
33
34 hold on %keeps from making new plots
35 p1 = plot(t_ms,f1,t_ms,f2,t_ms,f3,t_ms,f4,t_ms,f5,'LineWidth', 2);
36 %plot first 5 coefficients
37 p2 = plot(t_ms,f6,'LineWidth', 4); %plot 6th coefficient as thicker
38 plot([0,500], [0,0], 'k', 'LineWidth', 1) %plot horizontal line
39 grid on %turn on gridlines
40 ax = gca; %initialize gca
41 ax.GridAlpha = 0.4; %change grid
42 ax.FontSize = 16; %change chart font size
43
44 title({"ECE 202 Project 1 Phase 2: Power series expansion", ...
45       "of f(t)=7cos(20t) up to first 6 non-zero terms"},"FontSize",21)
46 %make title
47 xlabel("Time (t) in miliseconds","FontSize",18)
48 %add title for x
49 ylabel("First six non-zero terms of f(t)=7cos(20t)","FontSize",18)
50 %add title for y
51 ylim([-10 10])
```

```
52 %change bounds
53 terms = 1:6;
54 legend([p1; p2], "terms: "+ terms + ", n = " + n, Location="southoutside", ...
55         FontSize=18, NumColumns=3)
56 %create legend automatically
57
```

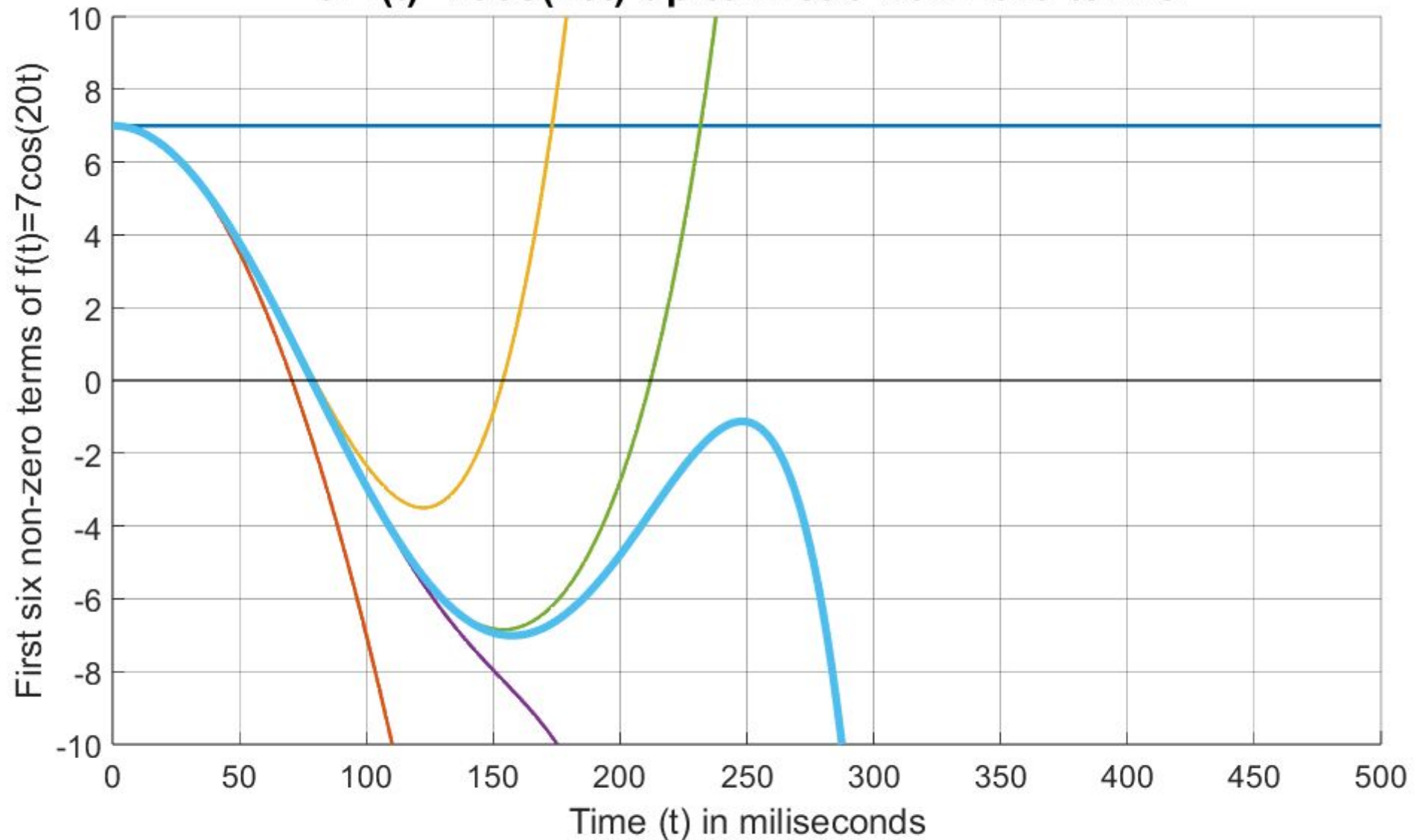
T =

6x2 table

n values	a_n values (Non-zero coefficients)
0	7
2	-1400
4	46667
6	-6.2222e+05
8	4.4444e+06
10	-1.9753e+07

>>

ECE 202 Project 1 Phase 2: Power series expansion of $f(t)=7\cos(20t)$ up to first 6 non-zero terms



terms: 1, $n = 0$ terms: 3, $n = 4$ terms: 5, $n = 8$
terms: 2, $n = 2$ terms: 4, $n = 6$ terms: 6, $n = 10$