```
% Aidan Chin
% 12/10/23
% ECE 202: Project 1 phase 4

%---initialize---

format shortG
clear
clc

%---setup---

A = 7; %amplitude of sinusoid
w = 10; %angular frequency of sinusoid
num_terms = 6; %number of non-zero terms
tmin = 0; %min time in ms
tmax = 500; %max time in ms
N = 1000; %number of points for plotting

t_ms = linspace(tmin,tmax,N); % make time array t in seconds from 0s to 0.5s
t = t_ms/1000; % convert time t to ms from 0ms to 500ms

n = [0:2:10]; % n values of non-zero coefficients
a_n = (-1).^(n/2).*(20.^n)*7./factorial(n); % a_n values of non-zero coefficients

%make a table
T = table(n',a_n','VariableNames', {'n values', ...
    'a_n values (Non-zero coefficients)'})

% ---- old calculations ----

f1 = a_n(1)*t.^n(1); % First term
f2 = f1 + a_n(2)*t.^n(2); % 1-2 term
f3 = f2 + a_n(3)*t.^n(3); % 1-3 terms
f4 = f3 + a_n(4)*t.^n(4); % 1-4 terms
f5 = f4 + a_n(5)*t.^n(5); % 1-5 terms
f6 = f5 + a_n(6)*t.^n(6); % 1-6 terms

% ---- plotting with new calc----

f = zeros([1 N]);

hold on %keeps from making new plots

for i = 1:num_terms
    f = f + a_n(i)*t.^n(i);
    if  i < 6
        p(i)=plot(t_ms,f,'LineWidth', 2);
    else
        p(i)=plot(t_ms,f,'LineWidth', 4);
        plot([tmin,tmax], [0,0], 'k', 'LineWidth', 1)
```

```
52      end
53  end
54
55  hold off
56  grid on %turn on gridlines
57  ax = gca; %initialize gca
58  ax.GridAlpha = 0.4; %change grid
59  ax.FontSize = 16; %change chart font size
60
61  title(sprintf("ECE 202 Project 1 Phase 4: Power series expansion \n of " + ...
62      "f(t)=%gcos(%gt) up to first %g non-zero " + ...
63      "terms",A,w,num_terms),Interpreter='latex',FontSize=21)
64  %make title
65  xlabel("Time (t) in miliseconds","FontSize",18)
66  %add title for x
67  ylabel(sprintf("First six non-zero terms of " + ...
68      "f(t)=%gcos(%gt)",A,w),Interpreter='latex',FontSize=18)
69  %add title for y
70  ylim([-1*(A+3) A+3])
71  %change bounds
72  terms = 1:6;
73  legend(p,"terms: "+ terms + ", n = " + n,Location="southoutside", ...
74      FontSize=18,NumColumns=3)
75  %create legend automatically
76
77  checkf = sum(f-f6) %checks difference between old and new calculations
78  %should be 0
79
```