ECE 202 - Project 1 - Phase 1

| n	$f^n(t)$	$f^n(0)$
0	$2\cos(40t)$	12
1	$-12(40)\sin(40t)$	0
2	$-12(40^2)\cos(40t)$	$-12(40)^2$
3	$12(40^3)\sin(40t)$	0
4	$+12(40^4)\cos(40t)$	$12\cdot(40^4)$
5	$-12(40^5)\sin(40t)$	0
6	$-12(40^6)\cos(40t)$	$-12\cdot(40^6)$

$$a_n = \begin{cases} \dfrac{12(-1)^{n/2}\cdot 40^n}{n!} & ,\ \because a_n = \dfrac{f^n(0)}{n!},\ n \text{ is even} \\[3mm] \dfrac{0}{n!} = 0 & ,\ n \text{ is odd} \end{cases}$$

. So, first 6 non-zero terms will be

$$n = 0, 2, 4, 6, 8, 10$$

```matlab
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 1 : Getting a relatively simple script working as quickly as
6 % possible
7
8 clear; clf;
9 format shortG;
10
11 tmin = 0;
12 tmax = 0.2; % in s
13
14
15 t = linspace(tmin, tmax, 401);  % time in s
16
17 n = 0:2:10;  % number of terms
18
19 % The coefficients associated with the power series expansion
20 an = 12*(-1).^(n/2).*40.^n./factorial(n)
21
22 f1 = an(1)*t.^n(1);       % first sum (ie. first term) in the power series
23 f2 = f1 + an(2)*t.^n(2); % sum of first two terms
24 f3 = f2 + an(3)*t.^n(3); % sum of first three terms
25 f4 = f3 + an(4)*t.^n(4); % sum of first four terms
26 f5 = f4 + an(5)*t.^n(5); % sum of first five terms
27 f6 = f5 + an(6)*t.^n(6); % sum of first six terms
28
29 plot(t,f1,t,f2,t,f3,t,f4,t,f5,t,f6,'LineWidth',1.6)
30 xlabel('time t (s)');
31 ylabel('f(t)')
32 ylim([-15,15])
33 title("ECE 202 Project 1 Phase 1")
34 subtitle("Power series expansion of f(t)=12cos(40t) using truncated " + ...
35     "sums with up to 6 non-zero terms.")
36
37 grid on
38
```

ECE 202 Project 1 Phase 1

Power series expansion of f(t)=12cos(40t) using truncated sums with up to 6 non-zero terms.
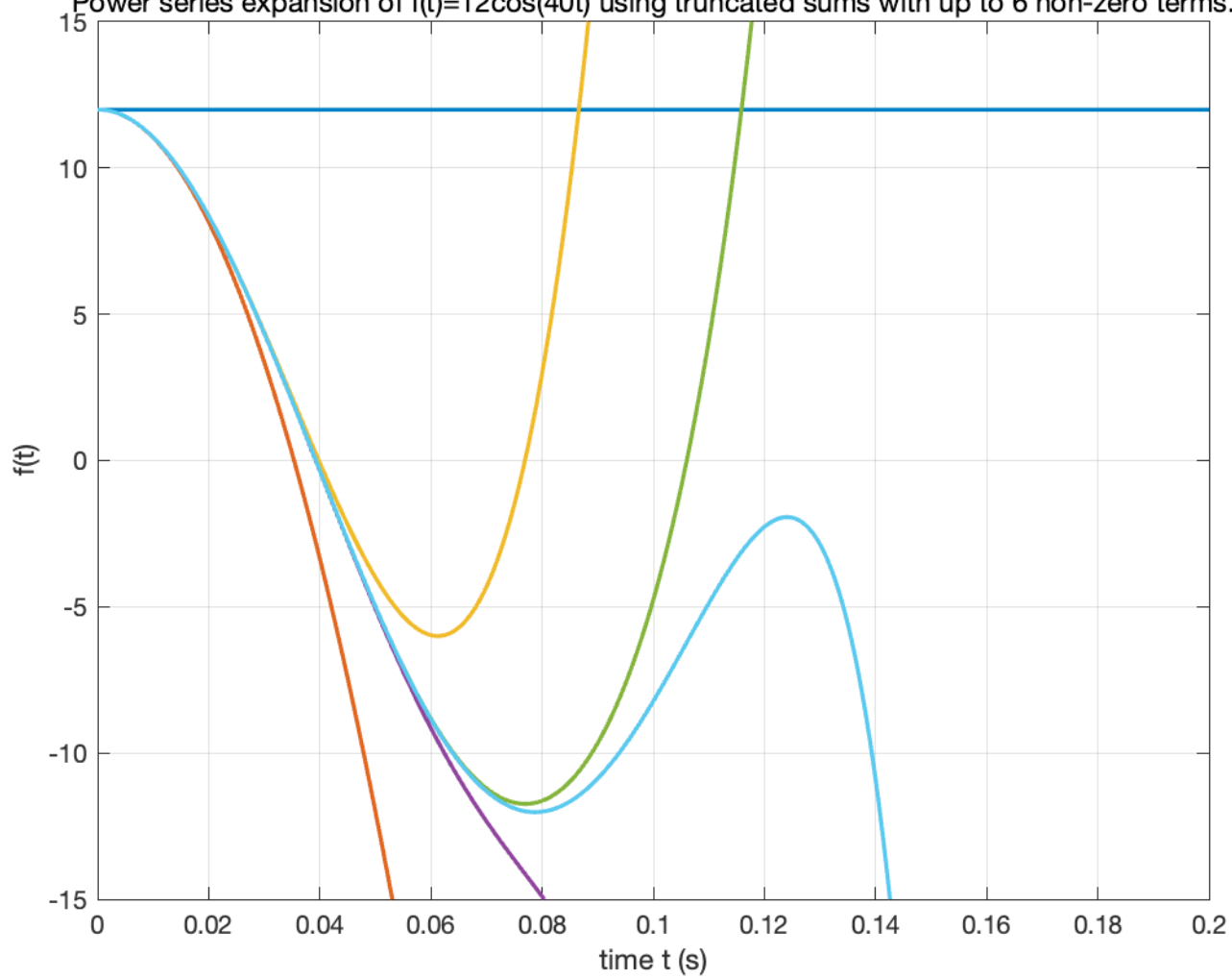
```
>> project1phase1

an =

        12        -9600      1.28e+06   -6.8267e+07    1.9505e+09   -3.4675e+10

>>
```