Otite-Atole Peace ✓

17/Eng04/002

Elect Elect

i) $4\frac{d^2x}{dt^2} + \frac{5dx}{dt} + 6x = \cos t$

Auxiliary Equation method

$C_{of} = m^2 + 5m + 6 = 0$

$(m-3)(m+2) = 0$

$m = -3$ or -2

$Ae^{-3t} + Be^{-2t}$

$f(t) = \cos t$

$= C\cos t + D\sin t$

$= C\cos t - D\sin t$

Substitute

$= -\cos t - D\sin t + 5(-C\sin t + D\cos t) + 6(\cos t)$

$= \cos t$

$= \cos t(5D + 5C) + \sin t(-5C + 5D) - \cos t$

$6D + 5C = 1$

$-5D - 5C = 0$

$10D = 1$

$D = 1$ $\qquad 5(1/20) + 5C = 1$

$1/2 + 5C = 1$

$C = 1/10$

General solution

$x = Ae^{-3t} + Be^{-2t} + \frac{1}{10}\cos t + \frac{1}{10}\sin t$

Substitute $(x - 0.1)' = 0$

$0.1 = A + B + 0.1 + 0$

$A + B = 0$ — eqn ①

$dA/dt = -3Ae^{3t} - 2Be^{-2} - \frac{1}{10}\sin t + \frac{1}{10}\cos t$

Substitute $\frac{dx}{dt} = 0$

$$0 = -3Ae^{-} - 2Be^{0} - \frac{1}{10}\sin 0 + \frac{1}{10}\cos(0)$$

$0 = -3A - 2B + 1/10$

~~A+B=0~~

~~3A+2B=0~~ ✓

$3A + 2B = 0$

$B = 1/10$

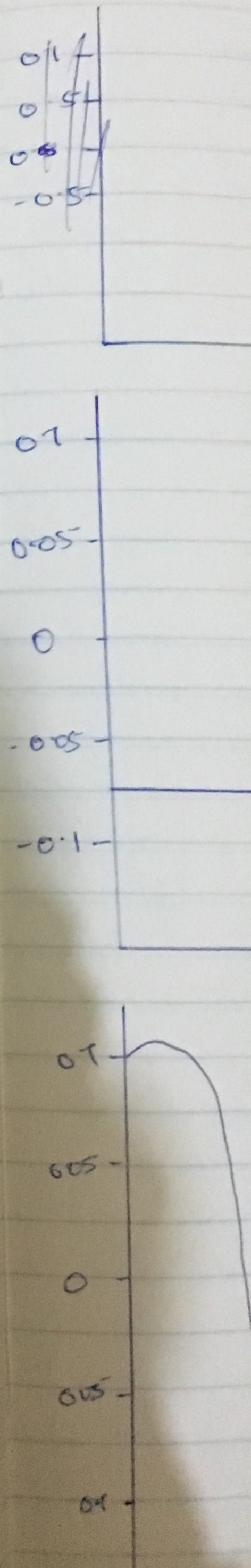
$-A = 0$ ✓

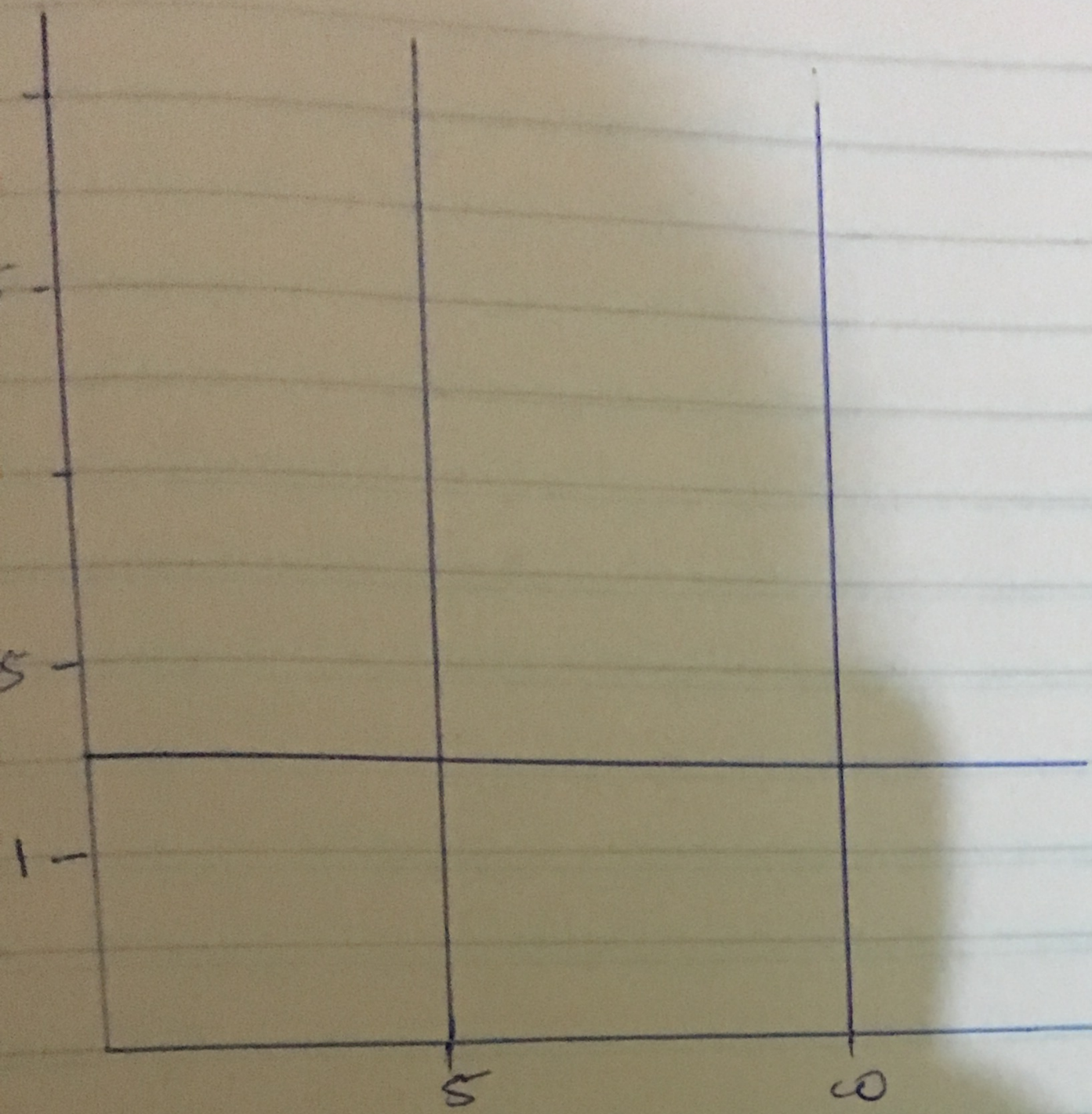
$A = 1/10$

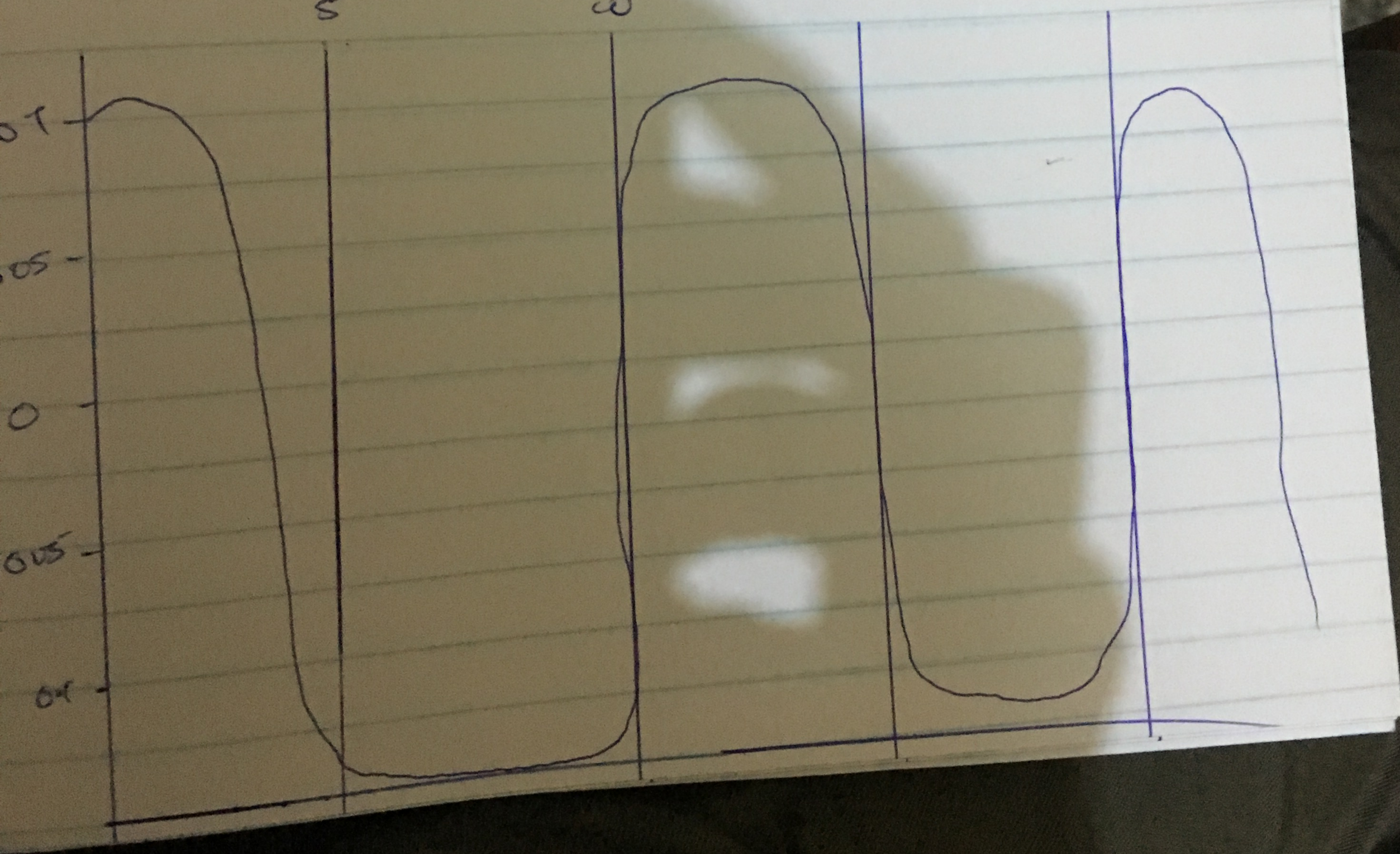
$$= \frac{1}{10}e^{3t} - \frac{1}{10}e^{-2t} + \frac{1}{10}\cos t + \frac{1}{10}\sin t$$

(B) MATLAB m file

```
clear
clc
close all
sym = t
t = 0:0.01:15
x = 0.1 * [exp(-3*t) - exp(-2*t) + cos(t) + sin(t)]
Xn = subs(x)
plot(t, Xn)
Axis height
grid on
grid minor
```




5
1
5
0


0.1
0.05
0
0.05
0.1