

Question 1

4a) Command Window

clc

close all

Syms n(t)

D = diff(n)

$$\text{ode} = (\text{diff}(n, t, 2)) - (\text{diff}(n, t)) - (12 * n) == 144 * t^3 + 12.5;$$

$$\text{Cond 1} = D(0) == -0.5;$$

$$\text{Cond 2} = n(0) == 5;$$

$$\text{conds} = [\text{Cond 1}, \text{Cond 2}];$$

$$\text{dsol}(t) = \text{dsolve}(\text{ode}, \text{conds});$$

$$\text{dsol} = \text{simplify}(\text{dsol}(t))$$

$$tn = [0 : 0.1 : 1.5];$$

$$\text{Sols} = \text{subs}(tn, \text{dsol}, tn)$$

$$\text{plot}(tn, \text{Sols})$$

grid on

$$\text{legend}('Sols', 'Location', 'best')$$

4b) Command window

close all

clear

clc

Syms y x t

ode1 = diff(y,t) - 2\*x == exp(-2t);

ode2 = diff(x,t) + y == exp(-t);

odes = (ode1, ode2);

ysol = dsolve(odes)

Cond1 = (x == 0)

Cond2 = (y == 0)

conds = (Cond1, Cond2)

ysol = dsolve(odes, conds)

(x\_solt, y\_solt) = dsolve(ode, conds)

x\_solt(t) = x\_solt

y\_solt(t) = y\_solt

~~plot(x\_solt)~~

~~hold on~~

~~plot(y\_solt)~~

~~grid on~~

(u) Visualizing the solution on graph separately  
f plot (xsolt)  
f plot (ysolt)  
grid on  
Legend ('xsolt', 'Location', 'best')  
Legend ('ysolt', 'Location', 'best')

(u) Visualizing the solution on graph together  
f plot (xsolt)  
hold on  
f plot (ysolt)  
grid on

4c) i) Command window

clc

clear

close all

Syms t s w x k a

$$x = k * \exp(-a * t) * \sin(5 * w * t) * \cos(3 * w * t)$$

$$F = \text{Laplace}(x, t, s)$$

Simplify(F)

Sols(ans)

u) Command window

clc

clear

close all

Syms t s

$$F = \frac{\pi}{(s^2 + 15 * \pi * s + 24 * (\pi^3))}$$

i laplace(F)

Simplify(ans)

Sols(ans)