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CHEMICAL ENGINEERING

17/ENG01/013

ENGINEERING MATHEMATICS ASSIGNMENT IV

QUESTION 4

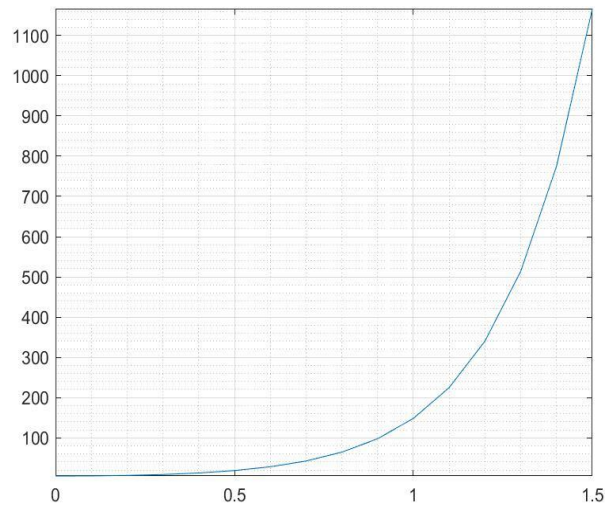
(a)

```
commandwindow
clear
clc
syms n(t)
ode=diff(n,t,2)-diff(n,t)-(12*n)==(144*t^3)+12.5;
Dn=diff(n,t);
ben=[n(0)==5,Dn(0)==-0.5];
rob=dsolve(ode,ben);
pretty(rob);
t=[0:0.1:1.5];
robn=subs(rob);
plot(t,robn);
axis tight;
grid on;
grid minor;
```

OUTPUT

$$\exp(-3 t) 2 - \frac{13t}{2} + \exp(4 t) 3 + 3 t^2 - 12 t^3$$

GRAPH



(b)

I) Together

```

commandwindow
clear
clc
close all
syms y(t) x(t)
ben=[diff(y,t)-(2*x)==exp(-2*t),diff(x,t)+y==exp(-t)]
vera=[y(0)==0,x(0)==0]
[yeq,xeq]=dsolve(ben,vera)
fplot(yeq)
hold on
fplot(xeq)
legend('yeq','xeq','location','best')
axis tight
grid on
grid minor

```

OUPUT

ben(t) =

[diff(y(t), t) - 2*x(t) == exp(-2*t), diff(x(t), t) + y(t) == exp(-t)]

vera =

$$[y(0) == 0, x(0) == 0]$$

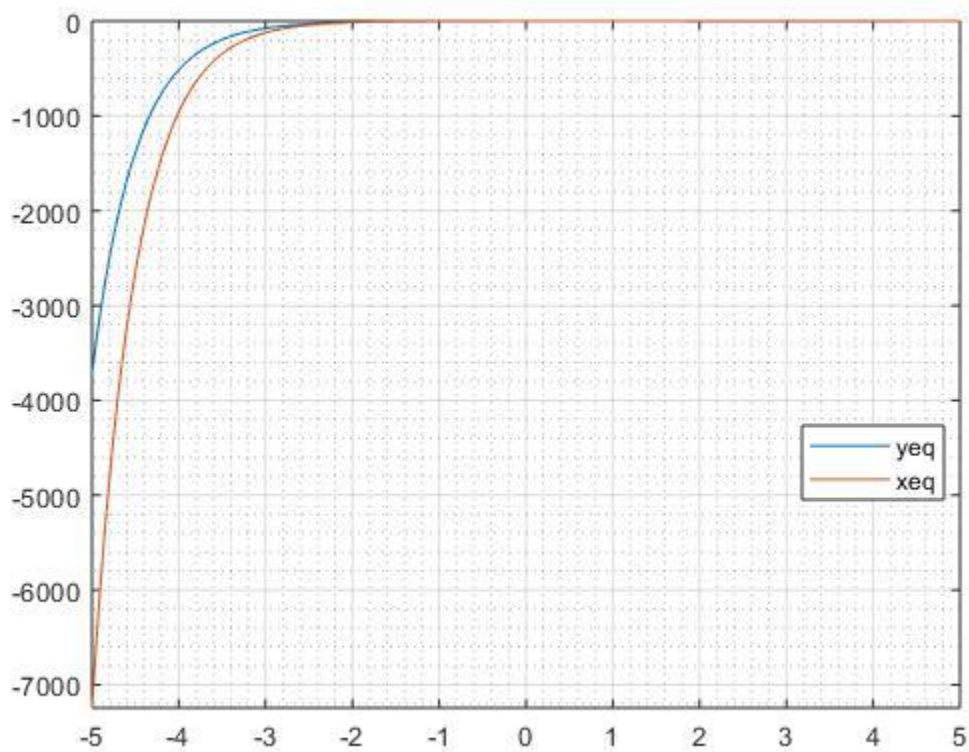
ueq =

$$(11^{1/2} \cdot \cos(\operatorname{atan}(2^{1/2}/3) - 2^{1/2} \cdot t))/6 - \exp(-2 \cdot t)/6 - \exp(-t)/3$$

veq =

$$(2 \cdot \exp(-t))/3 - \exp(-2 \cdot t)/3 - (2^{1/2} \cdot 11^{1/2} \cdot \cos(\operatorname{atan}((3 \cdot 2^{1/2}))/2) + 2^{1/2} \cdot t))/6$$

GRAPH



II) Separated

```
commandwindow
clear
clc
syms y(t) x(t)
ola=[diff(y,t)-2*x==exp(-2*t),diff(x,t)+y==exp(-t)]
bot=[y(0)==0,x(0)==0]
[yeq xeq]=dsolve(ola,bot)
figure(1)
fplot (yeq)
grid on
grid minor
figure(2)
fplot (xeq)
grid on
grid minor
```

OUTPUT

ola(t) =

[diff(y(t), t) - 2*x(t) == exp(-2*t), diff(x(t), t) + y(t) == exp(-t)]

bot =

[y(0) == 0, x(0) == 0]

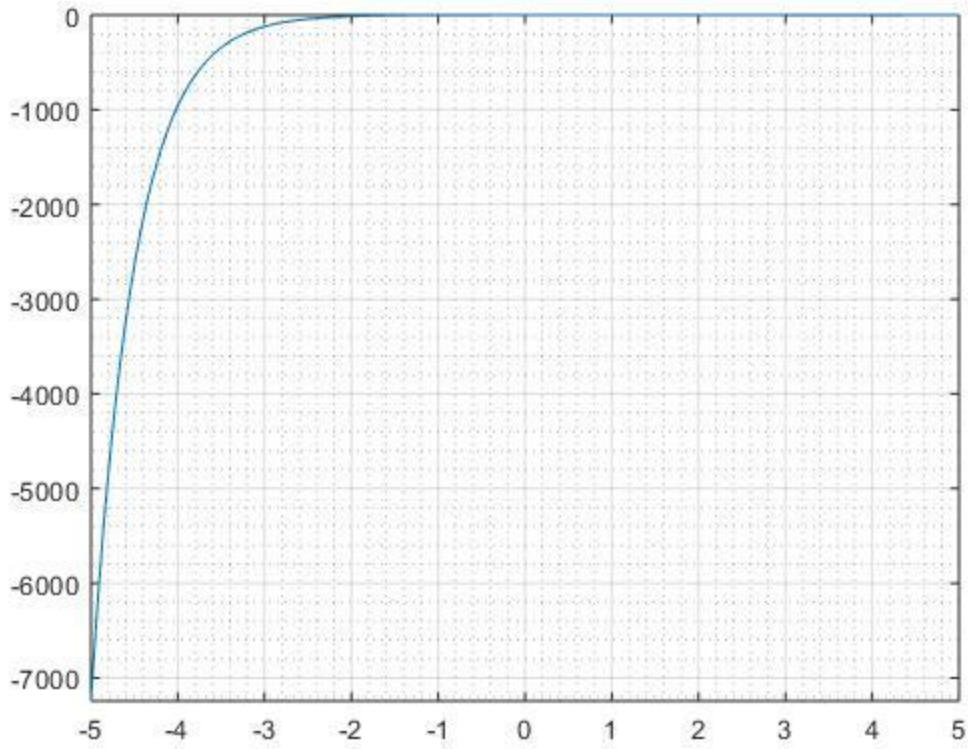
yeq =

$(11^{1/2} \cos(\text{atan}(2^{1/2}/3) - 2^{1/2}t))/6 - \exp(-2t)/6 - \exp(-t)/3$

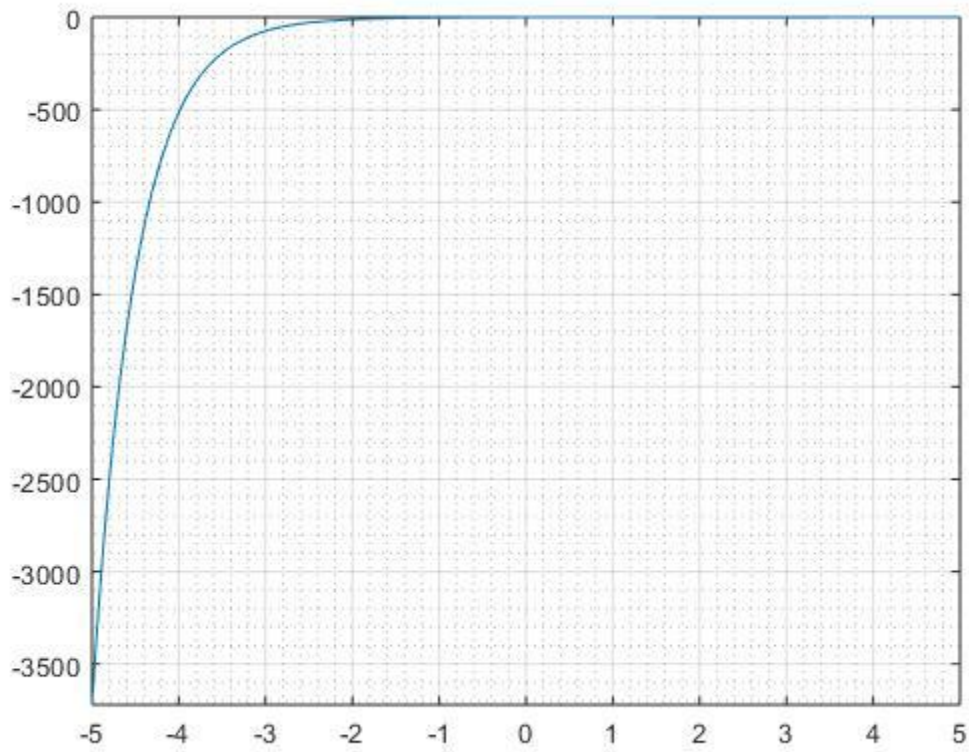
x_{eq} =

$$\frac{(2 \cdot \exp(-t))}{3} - \frac{\exp(-2t)}{3} - \frac{(2^{1/2} \cdot 11^{1/2} \cdot \cos(\operatorname{atan}((3 \cdot 2^{1/2})/2) + 2^{1/2}t))}{6}$$

GRAPH 1



GRAPH 2



(c)

i) commandwindow

clear

clc

syms t k a w

ft=k*exp(-a*t)*sin(5*w*t)*cos(3*w*t)

fs=laplace(ft)

OUTPUT

ft =

$$k \cdot \exp(-a \cdot t) \cdot \cos(3 \cdot t \cdot w) \cdot \sin(5 \cdot t \cdot w)$$

fs =

$$k \cdot (w / ((a + s)^2 + 4 \cdot w^2) + (4 \cdot w) / ((a + s)^2 + 64 \cdot w^2))$$

II) commandwindow

```
clear
```

```
clc
```

```
syms s
```

```
fs=pi/(s^2+15*pi*s+24*pi^3)
```

```
ft=ilaplace(fs)
```

OUTPUT

fs =

$$\pi / (s^2 + 15 \cdot \pi \cdot s + 1636404563713415 / 2199023255552)$$

ft =

$$\frac{\pi \cdot \sin(t \cdot (1636404563713415 / 2199023255552 - (225 \cdot \pi^2) / 4)^{1/2}) \cdot \exp(-(15 \cdot \pi \cdot t) / 2)}{(1636404563713415 / 2199023255552 - (225 \cdot \pi^2) / 4)^{1/2}}$$