18/ENG/06/033

The model eqn $y = \sin(0.25t) + 2te^{-0.5t} - 2\cos\frac{\pi t}{10}$

$0 \le t \le 10$ hrs, $\Delta t = 0.1$ h

```
t = 0:0.1:10
y = sin (0.25*t) + 2*t + exp (-0.5 t)
-2* cos (pi t/10), plot (t; y)
grid mnor
grid on
```

[t' y']			
0	-1.0000	1.4000	1.6375
		1.5000	1.8637
0.1000	-0.8555	1.6000	2.0935
0.2000	-0.7024	1.7000	2.3266
0.3000	-0.5413	1.8000	2.5628
0.4000	-0.3726	1.9000	2.3021
0.5000	-0.1969	2.0000	3.0441
0.6000	-0.0146	2.1000	3.2887
0.7000	-0.1738	2.2000	3.5358
0.8000	-0.3861	2.3000	3.7852
0.9000	-0.5679	2.4000	4.0367
1.0000	0.7727	2.5000	4.2903
1.1000	0.9824	2.6000	4.5456
1.2000	1.966	2.7000	4.8030
1.3000	1.4150	2.800	5.0619
2.9000	5.3223	6.0000	13.6216
3.0000	5.8410	6.1000	13.8820
3.1000	5.8730	6.2000	14.1412
3.2000	6.3116	6.3000	14.3990
3.3000	6.3770	6.4000	14.6555
3.4000	6.6433	6.5000	14.9105
3.5000	6.9106	6.6000	15.1640
3.6000	7.1787	6.7000	15.4160
3.7000	7.4475	6.8000	15.4160
3.8000	7.7167	7.0000	15.6664
3.9000	7.7167	7.1000	16.8074
4.0000	7.9866	7.2000	16.6509
4.1000	8.2568	7.3000	16.8923
4.2000	8.5274	7.4000	17.1322
4.3000	9.0692	7.5000	17.5100
4.4000	9.3402	7.6000	17.6058
4.5000	9.6112	7.7000	17.8346
4.6000	9.8821	7.8000	18.0713
4.7000	10.1529	7.9000	18.3009
4.8000	10.4234	8.000	18.5284
4.9000	10.6935	8.1000	18.7532
5.0000	10.9632	8.2000	18.9770
5.1000	10.9632	8.3000	19.1979
5.2000	11.2325	8.4000	19.4166
5.3000	11.5012	8.5000	19.6331
5.4000	11.7692	8.6000	19.872
5.5000	12.0305	8.7000	20.0591
5.6000	12.3031	8.8000	20.2086
5.7000	12.5688	8.9000	20.4758
5.8000	12.8335	9.0000	20.6807
5.9000	13.0973	9.1000	20.8833
9.2000	13.0973	9.2000	
9.3000	13.3600	9.3000	
9.4000	21.8832	9.4000	
9.5000	21.2810	9.5000	
9.6000	21.4764	9.6000	
9.7000	21.6494	9.7000	
9.8000	22.4482	9.8000	
9.9000	22.4175	9.9000	
10.0000	22.3987	10.000	

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18/ENG06/033
MECHANICAL ENG.
ENG 281

The set of models of a system is given in eqn (1) with the aid of methcad estimate the values of the x's in the model eqn.

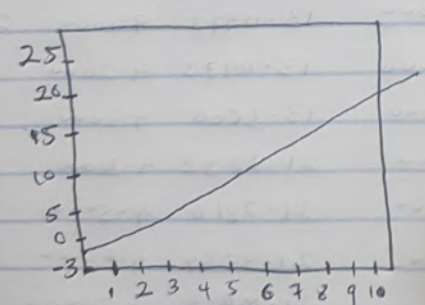
$$\begin{bmatrix} x_1 - 2x_2 - x_3 + 3x_4 = 10 \\ 2x_1 + 3x_2 + 4 = 8 \\ x_1 - 4x_3 - 2x_4 = 3 \\ -x_2 + 3x_3 + x_4 = -7 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 2 & 3 & 0 & 1 \\ 1 & 0 & -4 & -2 \\ 0 & -1 & 3 & 1 \end{bmatrix}$$

(C) $\begin{bmatrix} 10 \\ 8 \\ 3 \\ -7 \end{bmatrix}$

$$D = \begin{matrix} 0.0267 & 0.2400 & 0.4933 & 0.6667 \\ -0.0733 & 0.1600 & -0.2207 & -0.333 \\ -0.1067 & 0.0400 & 0.0267 & 0.333 \\ 0.2267 & 0.0400 & -0.3007 & -0.3333 \end{matrix}$$

$$E = \begin{matrix} -1.0000 \\ 2.0000 \\ -3.0000 \\ 4.0000 \end{matrix}$$



Mathcad Professional - [efe mathhhhhhhhh]

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$(x_2 - 2x_2 - x_3 + 3x_2) = 10$

$2x + 3x_2 + x_4 = 8$

$x_2 - 4x_3 - 2x_2 = 3$

$-x_2 + 3x_3 + x_2 = -7$

$$M = \begin{pmatrix} 1 & -2 & -1 & 3 \\ 2 & 3 & 0 & 1 \\ 1 & 0 & -1 & -2 \\ 0 & -1 & 3 & 1 \end{pmatrix}$$

$$B := \begin{pmatrix} 10 \\ 8 \\ 3 \\ -7 \end{pmatrix}$$

soln := isolve(M,B)

$$soln = \begin{pmatrix} -1 \\ 2 \\ -3 \\ 4 \end{pmatrix}$$

2 $y = \sin(0.25t) + 2t + e^{-0.85e} - 2\cos\left(\frac{\pi}{10}\right)t$

evaluation over the complex plane yields

$y = \sin(0.25t) + 2t + \exp(-.85 \cdot \exp(1)) - 2\cos\left(\frac{\pi}{10}\right)t$

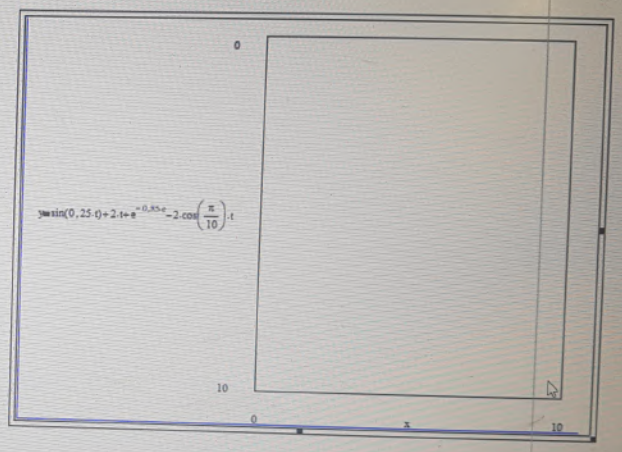
by factoring, yields

$y = \sin\left(\frac{1}{4} \cdot t\right) + 2 \cdot t + \exp\left(\frac{-17}{20} \cdot \exp(1)\right) - \frac{1}{2} \cdot \sqrt{2} \cdot \left(5 + \sqrt{5}\right)^{\left(\frac{1}{2}\right)} \cdot t$

$0 \le t \le 10$ $\Delta t = 0.1$

expands to

$0 \le t \le 10$



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10:49 P
11/15/2