

> restart

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

> AA := array([[2, 1, 4], [3, -2, 2], [1, 2, -1]])

$$AA := \begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 2 \\ 1 & 2 & -1 \end{bmatrix}$$

(1)

> with(linalg) :

> MatExp := simplify(exponential(AA, t)) : evalf(MatExp[1, 3], 2)

$$-0.50 e^{-2.9t} \cos(0.83t) + 0.50 e^{4.3t} + 0.16 e^{-2.9t} \sin(0.83t)$$

(2)

> AAA := simplify(map(rcurry(eval, t=0'), map(diff, MatExp, t)))

$$AAA := \begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 2 \\ 1 & 2 & -1 \end{bmatrix}$$

(3)

>

$$e^{4.28t} = B_0 + 4.29B_1 + 19.40B_2$$

$$e^{-2.64t} \cos(0.83t) = B_0 - 2.64B_1 + 6.28B_2$$

$$+ e^{-2.64t} \sin(0.83t) = +0.83B_1 - 4.38B_2$$

> WWW := array([[1, 4.29, 18.4], [1, -2.64, 6.28], [0, 0.83, -4.38]])

(4)

$$WWW := \begin{bmatrix} 1 & 4.29 & 18.4 \\ 1 & -2.64 & 6.28 \\ 0 & 0.83 & -4.38 \end{bmatrix} \quad (4)$$

```
> BBB := array([exp(4.28 t), exp(-2.64 t)·cos(0.83 t), exp(-2.64 t)·sin(0.83 t)])
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$$BBB := \begin{bmatrix} e^{4.28t} & e^{-2.64t} \cos(0.83 t) & e^{-2.64t} \sin(0.83 t) \end{bmatrix} \quad (5)$$

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> with(linalg) :
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> SOL := linsolve(WWW, BBB) :
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```
> Bcero := SOL1
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$$Bcero := 1.868636330 e^{-2.640000000 t} \sin(0.8300000000 t) + 0.1571474526 e^{4.280000000 t} + 0.8428525474 e^{-2.640000000 t} \cos(0.8300000000 t) \quad (6)$$

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> Buno := SOL2
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$$Buno := 0.2999034964 e^{-2.640000000 t} \sin(0.8300000000 t) + 0.1083809665 e^{4.280000000 t} - 0.1083809665 e^{-2.640000000 t} \cos(0.8300000000 t) \quad (7)$$

```
> Bdos := SOL3
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$$Bdos := -0.1714794744 e^{-2.640000000 t} \sin(0.8300000000 t) + 0.02053794571 e^{4.280000000 t} - 0.02053794571 e^{-2.640000000 t} \cos(0.8300000000 t) \quad (8)$$

```
> evalm(AAA)
```

$$\begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 2 \\ 1 & 2 & -1 \end{bmatrix} \quad (9)$$

```
> Ident := array([[1, 0, 0], [0, 1, 0], [0, 0, 1]])
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$$Ident := \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad (10)$$

```
> MatExponencial := evalm(Bcero·Ident + Buno·AAA + Bdos·AAA·2) : MatExponencial[1, 3]
```

$$0.170737140 e^{-2.640000000 t} \sin(0.8300000000 t) + 0.5567515403 e^{4.280000000 t} - 0.5567515403 e^{-2.640000000 t} \cos(0.8300000000 t) \quad (11)$$

```
> evalf(MatExp[1, 3], 2)
```

$$-0.50 e^{-2.9 t} \cos(0.83 t) + 0.50 e^{4.3 t} + 0.16 e^{-2.9 t} \sin(0.83 t) \quad (12)$$

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>
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