Ord: ___ ___

Differential Eqns
MAP2302 3228

U-Class

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U1: *Show no work.*

a A multivariate polynomial, where each monomial has the same degree, is circle

monogamous **atrocious** **gregarious**
monic **expialadocious** **homogeneous**
manic **unitary** **Unitarian** **utilitarian**

b With $G(x) := \sin(\sin(x))$, a soln to $y'' - y = G$ is $y := f \circledast G$,
where $f(x) =$ ....

c Fncs $x(t)$ and $y(t)$ satisfy this system of DEs,

$$\begin{aligned} x' + \;\; x - 3y &= 0\,, \\ y' + 6x - 8y &= 0\,. \end{aligned}$$

It can be written as $\mathsf{Y}' = \mathsf{M}{\cdot}\mathsf{Y}$,
where $\mathsf{Y} := \left[\begin{smallmatrix} x \\ y \end{smallmatrix}\right]$ and M is matrix ....

Characteristic poly of M is $\wp_{\mathsf{M}}(z) =$ ....

A soln has $x(t)$ a linear combination of $\mathrm{e}^{\alpha t}$ and $\mathrm{e}^{\beta t}$ for *numbers* $\alpha =$ .... and $\beta =$ ....

d Op $\mathsf{L}(y) := 3t^2y'' + 5ty' - y$ is equidim'nal. The gen.soln to $\mathsf{L}(y)=0$ is $y(t) = \alpha\cdot$ ______ $+ \beta\cdot$ ______ .

e Inverse of $\mathsf{C} := \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$, is $\mathsf{C}^{-1} =$ ________________.

Conjugating $\mathsf{W} := \begin{bmatrix} 9 & -5 \\ 10 & -6 \end{bmatrix}$ by C

gives diagonal matrix $\mathsf{D} := \mathsf{C}^{-1}\mathsf{W}\mathsf{C} =$ ________________.

Thus the $(2, 1)$-entry of $\mathsf{e}^{t\mathsf{W}}$ is ________________.

f $\mathbb{R}$-matrices $\mathsf{U}, \mathsf{G}, \mathsf{R}$ are $3{\times}3$, with U invertible and R nilpotent. [Use $\mathbf{I}$ for the $3{\times}3$ identity matrix.]

Matrix $\mathsf{U}\mathsf{R}\mathsf{U}^{-1}$ *is nilpotent*:	*AT*	*AF*	*Nei*
Each entry of $\mathsf{e}^{t\mathsf{R}}$ *is a polynomial*:	*AT*	*AF*	*Nei*
Matrix e^{R} *is nilpotent*:	*AT*	*AF*	*Nei*
R^2 *is the zero-matrix*:	*AT*	*AF*	*Nei*
Matrix $\mathsf{e}^{[\mathsf{G}+\mathbf{I}]\mathsf{G}}$ *equals* $\mathsf{e}^{\mathsf{G}} \cdot \mathsf{e}^{\mathsf{G}^2}$:	*AT*	*AF*	*Nei*
Matrix $\mathsf{e}^{[\mathsf{G}^2]}$ *equals* $\left[\mathsf{e}^{\mathsf{G}}\right]^2$:	*AT*	*AF*	*Nei*

U2: *Show no work.*

Suppose $y(0) = -2$, $y'(0) = 5$, $y''(0) = 2$. Then $\mathcal{L}\big(y^{(3)} + y^{(2)} + 3y\big)(s)$ equals $\big[[B(s)\cdot\widehat{y}(s)] + C(s)\big]$ for **polynomials**

$B(s)=$ ....

and $C(s)=$ ....

U1:	___ ___ ___	145pts
U2:	___ ___	20pts
Total:	___ ___ ___	165pts