Math 274 | IVP Thing | Name: _____

14 Nov 2017 | Show Appropriate Work | Scaled to $\boxed{10}$ points.

As usual, I hope you finish this in class, if not it is due Wednesday. We are interested in solving the initial value problem $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$, $\mathbf{x}(0) = \mathbf{x}_0$ where

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{bmatrix}, \text{ and } \mathbf{x}_0 = \begin{bmatrix} -8 \\ 6 \\ 22 \end{bmatrix}.$$

1. $\boxed{1}$ Vefify $\mathbf{x}_1 = \begin{bmatrix} -e^t \\ e^t \\ 2e^t \end{bmatrix}$ solves $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$.

2. $\boxed{1}$ Vefify $\mathbf{x}_2 = \begin{bmatrix} -2e^{2t} \\ e^{2t} \\ 4e^{2t} \end{bmatrix}$ solves $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$.

3. $\boxed{1}$ Vefify $\mathbf{x}_3 = \begin{bmatrix} -e^{3t} \\ e^{3t} \\ 4e^{3t} \end{bmatrix}$ solves $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$.

4. $\boxed{1}$ Show $W[\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3] \neq 0$.

5. $\boxed{1}$ Find a fundamental matrix $\mathbf{X}(t)$ for $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$ and then evaluate $\mathbf{X}(0)$.

6. $\boxed{3}$ Use row reduction to determine $\mathbf{X}^{-1}(0)$.

7. $\boxed{2}$ You will show in the Section 9.4 #28 that $\mathbf{x}(t) = \mathbf{X}(t)\mathbf{X}^{-1}(0)\mathbf{x}_0$ is the solution to the given initial value problem. Using the pieces you have computed, perform this mulitiplication and express $\mathbf{x}(t)$ as a vector function.