**Math 274 Homework** **Name:** ______________________

Sections: 9.4 Point Values in $\boxed{\text{boxes}}$.

Due: 5 June 2018

1. $\boxed{5}$ Verify

$$\left\{ \begin{bmatrix} -e^t \\ e^t \\ 2e^t \end{bmatrix}, \begin{bmatrix} -2e^{2t} \\ e^{2t} \\ 4e^{2t} \end{bmatrix}, \begin{bmatrix} -e^{3t} \\ e^{3t} \\ 4e^{3t} \end{bmatrix} \right\}$$

is a fundamental solution set to

$$\mathbf{x}'(t) = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{bmatrix} \mathbf{x}(t).$$

Recall a fundamental solution set for a system of $n$ first order equations is a set of $n$ linearly independent solutions. You should show each vector function is a solution. You should also show that they are linearly independent.

2. Consider the equation $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$ with $\mathbf{A} = \begin{bmatrix} -1 & 2 \\ -1 & -3 \end{bmatrix}$.

(a) $\boxed{3}$ Show

$$\left\{ \begin{bmatrix} 2e^{-2t}\cos t \\ -e^{-2t}(\cos t + \sin t) \end{bmatrix}, \begin{bmatrix} 2e^{-2t}\sin t \\ e^{-2t}(\cos t - \sin t) \end{bmatrix}, \right\}$$

is a fundamental solution set for $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$.

(b) $\boxed{1}$ Find a fundamental matrix for $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$.

(c) $\boxed{1}$ Solve the initial value problem $\mathbf{x}'(t) = \mathbf{A}\mathbf{x}(t)$, $\mathbf{x}(0) = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$.