Quiz 10; Tuesday, November 15
MATH 54 with Ming Gu
GSI: Eric Hallman

Student name:

You have 15 minutes to complete the quiz. Calculators are not permitted.

1. (4 points) Verify that the vector functions $\mathbf{x}_1 = \begin{bmatrix} e^t \\ e^t \end{bmatrix}$ and $\mathbf{x}_2 = \begin{bmatrix} e^{-t} \\ 3e^{-t} \end{bmatrix}$ are solutions to the homogeneous system $\mathbf{x}' = \mathbf{A}\mathbf{x} = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix} \mathbf{x}$ on $\mathbb{R}$.

2. (3 points) Verify that $\mathbf{x}_p = \begin{bmatrix} t \\ 2t-1 \end{bmatrix}$ is a particular solution to the nonhomogeneous system $\mathbf{x}' = \mathbf{A}\mathbf{x} + \mathbf{f}(t)$, where $\mathbf{f}(t) = \begin{bmatrix} 0 \\ t \end{bmatrix}$.

3. (1 points) Write the general solution for the problem $\mathbf{x}' = \mathbf{A}\mathbf{x} + \mathbf{f}(t)$.

4. (4 points) Demonstrate rigorously that $\mathbf{x}_1 = \begin{bmatrix} e^t \\ e^t \end{bmatrix}$ and $\mathbf{x}_2 = \begin{bmatrix} e^{-t} \\ 3e^{-t} \end{bmatrix}$ are linearly independent on $\mathbb{R}$.