MATH 54 QUIZ II, KYLE MILLER
APRIL 12, 2016, 30 MINUTES
(4 PAGES)

Problem Number	1	2	3	Total
Score				

YOUR NAME: _____

No calculators, no references, no cheat sheets.
Answers without justification will receive no credit.

1. (5 points) Let $A = \begin{pmatrix} 2 & -2 & 1 \\ 1 & 2 & 2 \\ 2 & 1 & -2 \\ 0 & 0 & 1 \end{pmatrix}$. Find the least-squares solution(s) to $A\vec{x} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$.

2. (5 points) Consider the differential equation $y'' + 2y' + 2y = \cos(t)$.

a. Find the general solution to this differential equation.

b. Solve the initial value problem $y(0) = 0$ and $y'(0) = 0$.

3. (5 points) The 2×2 matrix A is symmetric with two eigenvalues 2 and 1. One eigenvector of A is $\left(\begin{smallmatrix} 2 \\ -1 \end{smallmatrix}\right)$ with the corresponding eigenvalue 2. Compute A. (Hint: consider using spectral decomposition.)

For fun. (0 points) (Inessential motivation: a falling particle is subject to wind resistance proportional to its velocity. What is its terminal velocity?) Consider $y'' + cy' = g$, where c and g are positive constants.

(a) Compute the general solution to this differential equation.

(b) Compute $\lim_{t\to\infty} y'(t)$. Does this depend on initial conditions?

(To check your answer: how would a physicist solve this problem with only a free body diagram?)