MAT-150: Linear Algebra
Homework 5

Due: 11/17/2017

Book Problems.

Please turn in your solution for each of the following exercises.

§6.1: 29, §6.2: 25, §6.3: 23

Other Problems.

Problem 1.

Consider the data points

$$\{(0,0),(1,2),(2,3)\}.$$

a. Form a matrix equation ($Ax = b$) that can be used to find the slope and y-intercept of the line of best fit through these points. Identify which variables correspond to the slope and y-intercept of the line, and argue why this system has no solution.

b. Compute an orthogonal basis for $\mathrm{Col}(A)$ using the Gram-Schmidt process. Store these vectors as the column vectors of a matrix $\mathcal{O}$.

c. Compute the matrix R such that $A = \mathcal{O}R$.

d. Use the matrices $\mathcal{O}$ and R to solve the matrix equation $Ax = b$. Interpret the results in terms of the line of best fit. What is the error in your approximation?

Problem 2.

Consider the overdetermined system

$$\begin{bmatrix}1\\1\end{bmatrix} x = \begin{bmatrix}9\\5\end{bmatrix}.$$

a. Before you do anything, guess a solution for the best approximation of the system. Provide detail for the intuition of your guess, so it is clear you did not reverse engineer this guess.

b. Solve for the best approximation by applying a rotation to both sides. Report the solution and error of the best approximation.