

Name: _____

MATH 108

Fall 2022

HW 16: Due 11/22

“Algebra is the offer made by the devil to the mathematician. . . All you need to do, is give me your soul: give up geometry.”

–Michael Atiyah

Problem 1. (10pt) Suppose you have a 3-day drive. You drive at an average speed of 55 mph, 65 mph, and 60 mph each day, respectively. Furthermore, you drive for 10 hours, 8 hours, and 5 hours each day, respectively. Represent your speeds each day as a vector \mathbf{v} and your drive times as a vector \mathbf{t} . Compute $\mathbf{v} \cdot \mathbf{t}$ and interpret the result.

Problem 2. (10pt) Bill, Bob, and JoBob had a three day work week. The number of hours they worked each day, in the order listed, is represented as a column of the matrix A given below. Their hourly pay, again in the order listed, is represented as a row in the column vector \mathbf{u} given below.

$$A = \begin{pmatrix} 7 & 8 & 6 \\ 8 & 8 & 8 \\ 5 & 12 & 9 \end{pmatrix}, \quad \mathbf{u} = \begin{pmatrix} 15 \\ 12 \\ 20 \end{pmatrix}$$

Compute $A\mathbf{u}$ and interpret the entries of the resulting vector.

Problem 3. (10pt) Assume that each of the following matrices are the reduced-row echelon form from some system of equations. For each, indicate whether there was a solution to the system or not. If there was a solution, either give the solution or give a parametrization of all possible solutions.

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & -4 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 0 & 0 & 7 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$