

M340L First Midterm Exam Solutions

Problem 1: Ans: $\vec{x} = t \begin{pmatrix} -3 \\ -2 \\ 1 \\ 0 \end{pmatrix} + \begin{pmatrix} 1 \\ -1 \\ 0 \\ 3 \end{pmatrix}$

Problem 2 a) The matrix is $\begin{pmatrix} 1 & 2 & -1 \\ -5 & 0 & 1 \end{pmatrix}$

b) B is never 1-1, since it has more columns than rows.

c) When $h \neq 2$, the two rows are not multiples of each other, there are 2 pivots, and B is onto.

Problem 3. a) Write down the matrix whose columns are u, v, w and α . This matrix, put in REF, becomes $\begin{pmatrix} 1 & 3 & 3 & 1 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$. Since there is a pivot in the last column, the system is inconsistent, so α is NOT in the span of u, v, w .

b) NOT independent. $w = 2v - 3u$.

Problem 4. A is invertible. By row reducing $[A \ I]$ you get $[I \ A^{-1}]$. The answer is

$$A^{-1} = \begin{pmatrix} -1 & 12 & -5 \\ 1 & -9 & 4 \\ 0 & 2 & -1 \end{pmatrix}.$$

Problem 5. True or False The true statements are a, c, d, f, and g. About the false statements...

b) A is 1-1 but not onto.

e) If the columns are linearly independent, then A is 1-1, not onto.