Quiz #1

MATH 316 — Linear Algebra II
Monday, Feb 17

Please print your name:

Problem 1. We want to find values for the parameters a, b, c such that $z = a + bx + c\ln(y)$ best fits some given points $(x_1, y_1, z_1), (x_2, y_2, z_2), \ldots$ Set up a linear system such that $[a, b, c]^T$ is a least squares solution.

Problem 2. Let $A = \begin{bmatrix} 1 & 5 & -2 & 0 & -4 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}$.

(a) A basis for $\operatorname{null}(A)$ is ______. A basis for $\operatorname{col}(A)$ is ______.

(b) $\dim \operatorname{col}(A) =$ ______, $\dim \operatorname{row}(A) =$ ______, $\dim \operatorname{null}(A) =$ ______, $\dim \operatorname{null}(A^T) =$ ______

Problem 3. Fill in the blanks.

(a) $\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} =$ ______

(b) $\hat{\boldsymbol{x}}$ is a least squares solution of $A\boldsymbol{x} = \boldsymbol{b}$ if and only if ______.

(c) $\operatorname{col}(A)$ is the orthogonal complement of ______. $\operatorname{null}(A)$ is the orthogonal complement of ______.

(d) The linear system $A\boldsymbol{x} = \boldsymbol{b}$ is consistent if and only if $\boldsymbol{b}$ is orthogonal to ______.

(e) The projection matrix for orthogonally projecting onto $\operatorname{col}(A)$ is $P =$ ______.

[We assume that the columns of A are linearly independent.]

(f) If W is the subspace of $\mathbb{R}^4$ of all solutions to $x_1 + 2x_2 + x_3 - x_4 = 0$, then $\dim W =$ ______, $\dim W^\perp =$ ______.

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