(1) How to row reduce a matrix A to its reduced row echelon form $\text{rref}(A)$? Theorem 1.18 (Gauss-Jordan), Example 1.19, Remark 1.20

(2) Can you tell the number of solutions to a given system of linear equations from its augmented/coefficient matrix? Theorem 1.27 (Rouché-Capelli), Example 1.28

(3) Given a system of linear equations, can you write down a vector equation with the same solution set, and vice versa? Proposition 2.7, Activity 2.3

(4) How to check if a set of vectors is linearly dependent or independent? CAP 2.5, Theorem 2.11, CAP 2.6, Proposition 2.12

(5) What are the conditions a vector space needs to satisfy? How can we check if a set is a vector space? Definition 3.1, CAP 3.1, Proposition 3.2, CAP 3.2

(6) For a given vector subspace $V = \text{Span}(\vec{v}_1, \ldots, \vec{v}_n)$ of $\mathbb{R}^m$, how can we find a basis of V (as a subset of $\{\vec{v}_1, \ldots, \vec{v}_n\}$)? CAP 3.5, Theorem 3.11, CAP 3.6

(7) Can you write any linear combination of vectors as some matrix-vector product? Definition 4.1

(8) Given a linear transformation $F : \mathbb{R}^n \to \mathbb{R}^m$, how does its defining matrix look like? Theorem 4.8, CAP 4.5

(9) Let $F : \mathbb{R}^n \to \mathbb{R}^m$ be a linear transformation. If you already know the rref of its defining matrix M_F, can you tell if F is injective or surjective, as well as the rank and nullity of F? Theorem 4.14, Theorem 4.17, CAP 4.8, Theorem 5.8

(10) Given a matrix A, can you write $\text{Col}(A)$ as the span of some set of vectors, and $\text{Nul}(A)$ as the solution set to some system of linear equations (or matrix-vector equation)? Proposition 5.6, CAP 5.4

(11) Can you write the solution set to a general consistent system of linear equations as some set related to its coefficient matrix? Remark 5.11, Theorem 5.12

(12) What are the defining matrices of the addition of two linear functions, the composition of two linear functions, and the inverse of a bijective linear function? Definition 6.1, CAP 6.3, Definition 6.3, CAP 6.5, Definition 6.7

(13) For any two arbitrary matrices A, B, when can we define the matrix product AB? CAP 6.4, Remark 6.5

(14) How to detect if a matrix is invertible? If it is invertible, how to obtain its inverse matrix? Example 6.10, Theorem 6.11, Proposition 6.14, Theorem 6.15 (Invertible Matrix Theorem)

(15) For any elementary row operation, if you perform it to a matrix A, can you write the result as the matrix product EA for some elementary matrix E? And what is E^{-1} and its corresponding elementary row operation? CAP 6.7, Proposition 6.13