Linear Algebra: Sample Test 2 Questions

Part 1: Fill in the Blank Questions (3 points each - 30 points total) There may be more than one possible answer for a fill-in-the-blank question. Full credit answers are ones that demonstrate deep understanding of linear algebra from class and homework.

1. $\begin{bmatrix} -1 & 3 \\ 2 & 4 \\ 5 & -3 \end{bmatrix} \begin{bmatrix} 4 & -2 \\ -2 & 3 \end{bmatrix}$ = (show work, but no need to reduce) _____

2. The inverse of $\begin{bmatrix} 4 & -2 \\ -2 & 3 \end{bmatrix}$ is (show work, but no need to reduce) _____

3. To solve $A\vec{x} = \vec{b}$ with A as in the last question, we can _____

4. If the condition number is on the order of 10^4 then that tells us that we may lose up to _____

5. In linear algebra, span means _____

6. A rotation that rotates counterclockwise by θ is represented in matrix form as _____

7. If I use the implicitplot3d command in Maple on the equations corresponding to the rows of the augmented matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 5 & 6 & 7 \\ 0 & 0 & 8 & 9 \end{bmatrix}$ we would see _____ intersecting in _____

8. $\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$ has columns that _____

9. A real-life application of [a topic from the new material] is _____

10. If A is an invertible $n \times n$ matrix, and $\vec{x}$ and $\vec{b}$ are $1 \times n$ vectors, then $A\vec{x} = \vec{b}$ has _____ solution(s).

Part 2: Computations and Interpretations (40 points)

There will be some by-hand computations and interpretations, like those you have had previously for homework, clicker questions and in the problem sets. You are not expected to remember page numbers or Theorem numbers, but you are expected to be comfortable with definitions, "big picture" ideas, computations, analyses...

You can expect this section to be a question with numerous parts, adapted from (or combining) these types of questions:

2.1 #9, 21, 23
Clicker in 2.1 and 2.2 #7
2.2 #13, 17, 21, 23
2.3 #19, 21, 23
Problem Set 3 #1 or 2 or 4
2.7 #9

Part 3: True/False (3.75 points each - 30 points total) Follow the directions below each:
Circle True OR correct the statements as directed:

a) If $A = \begin{bmatrix} 4 & 6 \\ 20 & 7 \end{bmatrix}$ then $\underline{\underline{5A =}} \begin{bmatrix} 20 & 6 \\ 20 & 7 \end{bmatrix}$
Circle True OR (only if false) correct the statement after $\underline{\underline{5A =}}$

b) Each column of AB is a linear combination of the columns <u>of</u> B using weights from the corresponding columns of A.
Circle True OR (only if false) correct the statement after <u>of</u>

c) The transpose of a product of matrices equals the product of their transposes in <u>the</u> same order
Circle True OR (only if false) correct the statement after <u>the</u>

d) $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} .A$ is the same as modifying A <u>via</u> $r_2' = 3r_1 + r_2$
Circle True OR (only if false) correct the statement after <u>via</u>

e) To keep a car on a curved race track, we can perform the appropriate matrix operations in the following <u>order</u> (Rotate).(Translate_to_curve).car
Circle True OR (only if false) correct the statement after <u>order</u>

f) If the equation $A\vec{x} = \vec{0}$ has a nontrivial solution, <u>then</u> $A_{n \times n}$ has fewer than n pivot positions.
Circle True OR (only if false) correct the statement after <u>then</u>

Circle True OR provide a counterexample as directed:

g) A not square can never have only the trivial solution.
Circle True OR provide a counterexample

h) If A is an nxn matrix then the equation $A\vec{x} = \vec{b}$ has at least one solution for each $\vec{b}$ in $\mathbb{R}^n$.
Circle True OR provide a counterexample