Part I (due Wednesday, February 7 at the beginning of class)

To review linear independence and dependence and prepare to delve into them more fully, download the Systems of Equations chapter from Linear Algebra and Applications: An Inquiry-Based Approach and read pages 103–108, stopping when you get to Activity 6.2. Do Preview Activity 6.1 as your reading question when you get to it in the text.

Reading Questions

Preview Activity 6.1 in the section you read.

Part II (due Wednesday, February 7)

1. Complete these examples:

   Example 1. (a) If $A = \begin{bmatrix} 1 & 4 & 3 \\ -1 & -2 & 0 \\ 2 & 2 & 3 \end{bmatrix}$, find A^{-1} (if it exists).

   (b) If $A = \begin{bmatrix} 4 & 2 \\ 10 & 5 \end{bmatrix}$, find A^{-1} (if it exists).

   (c) What does the Purple Theorem tell us about the system of equations

   $$\begin{aligned} x_1 + 4x_2 + 3x_3 &= 0 \\ -x_1 - 2x_2 \qquad &= 0 \\ 2x_1 + 2x_2 + 3x_3 &= 0? \end{aligned}$$

2. Activity 6.1 in the section you read.

Part III: Homework (due Wednesday, February 14♡ at the beginning of class)

1. A square matrix A is *idempotent* if $A^2 = A$.

   (a) Show that if A is idempotent, then so is $I - A$.

   (b) Show that if A is idempotent, then $2A - I$ is invertible and $(2A - I)^{-1} = 2A - I$.

2. True or False? If true, prove; if false, give an explained counterexample.

   (a) If an $m \times n$ matrix A has a pivot in every row, then the equation $A\vec{x} = \vec{b}$ has a unique solution for every $\vec{b} \in \mathbb{R}^m$.

   (b) If $\vec{x}_0$ is a solution for $A\vec{x} = \vec{b}_0$ and $\vec{x}_1$ is a solution for $A\vec{x} = \vec{b}_1$, then $\vec{x}_0 + \vec{x}_1$ is a solution for $A\vec{x} = \vec{b}_0 + \vec{b}_1$.

   (c) If $\vec{x}_0$ is a solution for $A\vec{x} = \vec{b}$, then cx_0 is a solution for $A\vec{x} = c\vec{b}$, where c is a scalar.

   (d) If A is a 3×4 matrix, then the homogeneous system $A\vec{x} = \vec{0}$ has only the trivial solution.

   (e) If A is a 3×2 matrix, then the homogeneous system $A\vec{x} = \vec{0}$ has non-trivial solutions.

Running list of vocabulary words that could be a quiz word

- linear equation
- system of linear equations
- linear combination of a set of vectors
- span of a set of vectors
- linearly independent
- linearly dependent
- reduced row echelon form
- pivot
- homogeneous system
- free variable
- row equivalent
- consistent system
- inconsistent system
- trace of a matrix
- transpose of a matrix
- inverse of a matrix
- elementary matrix