The tests are cumulative. This guide gives some sample questions for Sections 1.1–3, 1.4, 1.6, 1.7, 2.1–3, 2.5, and 2.6. Doing these problems does not replace doing homework problems.

1. Define each of the following:
   (a) row-reduced form of a matrix
   (b) consistent linear system
   (c) homogeneous linear system
   (d) linearly dependent vectors
   (e) rank of a matrix
2. Let $\mathbf{A} =$ [some 2×2 or 3×3], $\mathbf{C} =$ [some 2×2 or 3×3] and $\mathbf{b} =$ [some 2×1 or 3×1].
   (a) Compute $\mathbf{AC}$. Compute $\mathbf{A} - 2\mathbf{I}$. Compute $\mathbf{Ab}$. Compute $\mathbf{A}^T\mathbf{C}$.
   (b) Compute the length of $\mathbf{b}$.
   (c) Compute the rank of $\mathbf{A}$.
   (d) Solve $\mathbf{Ax} = \mathbf{b}$. [May have one, zero, or many solutions.]
   (e) Solve $\mathbf{Cx} = \mathbf{b}$. [May have one, zero, or many solutions.]
3. Let $\mathbf{A} =$ [some 3×3] and $\mathbf{b} =$ [some 3×1].
   (a) Write the augmented matrix representing the system $\mathbf{Ax} = \mathbf{b}$.
   (b) Use Gaussian Elimination to transform the augmented matrix to row-reduced form.
   (c) Use the row-reduced form of the augmented matrix to solve $\mathbf{Ax} = \mathbf{b}$ for $\mathbf{x}$.
   (d) Multiply $\mathbf{Ax}$ to check that it equals $\mathbf{b}$.
4. (a) Define what it means for a set of vectors to be linearly independent.
   (b) Determine if the set of vectors
   $$\left\{ \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix} \right\}$$
   is linearly independent.
5. Some word problem where you have to form and solve a linear system.