1.8 21. a. True. See def. before 1.8 20. A linear transformation is a function with certain properties.

b. False. The domain is \( \mathbb{R}^2 \). See the paragraph before example 1.

c. False. The range is the set of all linear combinations of the columns of \( A \). See paragraph before example 1.

d. False. See the paragraph after the definition of a linear transformation.

e. True. See the paragraph after equation (4).

24. (3 points) Any vector \( \mathbf{x} \in \mathbb{R}^n \) can be written as a linear combination of \( \mathbf{v}_1, \ldots, \mathbf{v}_p. \)

25. (3 points) Let \( T(\mathbf{x}) = \mathbf{Ax} + \mathbf{b}, \mathbf{v} \in \mathbb{R}^n. \)

26. (3 points) If \( b \neq 0 \) then \( T(0) = A \cdot 0 + b \neq 0 \). So \( T \) is not a linear transformation.

29. (4 points) Reflect through \( x_2 = x_1. \)

30. (4 points) Reflect through \( x_1 = x_2. \)

32. (3 points) \( X = \begin{bmatrix} 5 7 \end{bmatrix} \)

35. (2 points) onto: \( \mathbb{R}^m \). One-to-one: \( \mathbb{R}^m \).

1.10. (6 points) \( \mathbf{y}_1 = \begin{bmatrix} 7.2 \end{bmatrix}, \mathbf{z}_1 = \begin{bmatrix} 541.0000 \end{bmatrix}, \mathbf{z}_2 = \begin{bmatrix} 5777.908 \end{bmatrix} \)

A. In the previous year, \( 4257 \) (\( \frac{2}{3} \) m) people lived in the city, \( 571429 \) (\( \frac{3}{4} \) m) people lived in the suburbs.
2.1 25 points

2.2 7 points

b. $[A B C D] = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & -2 & 1 & -2 \\ 0 & 0 & 1 & 3 \end{bmatrix}$