1.9 4 points a. False, see the paragraph preceding Example 2.
   b. True, see Theorem 10.
   c. True, see Table 1.
   d. False, see def of one-to-one
   e. True, see the solution of Example 5.

2.1 12 points A suitable column for B is any multiple of (2,1), e.g., $\mathbf{v} = \begin{bmatrix} 2 \\ 6 \\ 3 \end{bmatrix}$

2.2 10 points a. False, the product of inverses should be in the reverse order, e.g., Theorem 5(c).
   b. True, by Theorem 6(a)
   c. True, by Theorem 4.
   d. True, by Theorem 7.
   e. False. This is a misstatement of Theorem 7.

2.2 23 points $Ax = 0$ has only the trivial solution $\Rightarrow$ there are no free variables in $A \mathbf{x} = 0$

Thus each column of $A$ is a pivot column.

23 3 points $A^{-1} = B = \begin{bmatrix} -1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ 0 & 0 & \cdots & -1 \end{bmatrix}$

< note: $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

is an integration matrix

(discrete, i.e. summation) — fog it.

This is a differentiation matrix.

23 6 points Not invertible. The matrix reduces to $\begin{bmatrix} 0 & 0 & \frac{1}{3} \\ 0 & 0 & 0 \end{bmatrix}$, and is not row equivalent to $I$.

So you've proved the inverse of integration is
differentiation (directly).
2.3 [3 points] a. True. Statement (b) of the IMT is true \( \Rightarrow \) (f) is true.

b. True \( \Rightarrow \) (e) \( \Rightarrow \) (b) is true.

c. True. See remarks following the proof of the IMT.

d. False. If \( A \) is any \( m \times n \) matrix, the linear transformation \( x \mapsto Ax \) maps \( \mathbb{R}^n \) to \( \mathbb{R}^m \), yet not every such matrix has a pivot position.

e. True, by IMT

25 [2 points] \( 2y = b \Rightarrow y = \begin{bmatrix} 2 \\ 7 \end{bmatrix} \), \( u \times y = \Rightarrow x = \begin{bmatrix} 1/4 \end{bmatrix} \).