(1)(a) 74 (b) -4 (c) \[ A + B = \begin{bmatrix} 0 & 2 & 0 \\ 7 & 3 & -4 \\ 1 & -2 & -1 \end{bmatrix} \], \( \det(A + B) = 6. \)

(2)(a) \[ x = \begin{bmatrix} -16/13 \\ 7/13 \\ 0 \end{bmatrix} \]. (b) Yes, the row reduction in (a) shows that the rank is 3, which means \( A \) is nonsingular. (c) No, since \( A \) is nonsingular the system is always consistent no matter what \( b \) is, because \( Ax = b \) has solution \( x = A^{-1}b. \)

(3)(a) \[ \begin{bmatrix} -1 \\ -9 \end{bmatrix} \] (b) \( S \) is closed under addition and scalar multiplication. To show this, suppose \( A, B \in S \). This means \( A_{11} = A_{22} \) and \( B_{11} = B_{22} \). But then \( (A + B)_{11} = A_{11} + B_{11} = A_{22} + B_{22} = (A + B)_{22} \) which says that \( A + B \in S. \) Also, if \( A \in S \) and \( k \) is a real number then \( (kA)_{11} = kA_{11} = kA_{22} = (kA)_{22} \) which says \( kA \in S. \)

(4) \[ A^{-1} = \begin{bmatrix} -40 & 16 & 9 \\ 13 & -5 & -3 \\ 5 & -2 & -1 \end{bmatrix} \]