Solution to Practice 3g

B1(a) The domain of f_A is $\mathbb{R}^3$, because A has 3 columns. The codomain of f_A is $\mathbb{R}^2$, because A has 2 rows.

B1(b) $f_A(3,4,-5) = \begin{bmatrix} -1 & 4 & -2 \\ -5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ -5 \end{bmatrix} = \begin{bmatrix} -3+16+10 \\ -15+12-5 \end{bmatrix} = \begin{bmatrix} 23 \\ -8 \end{bmatrix}$

$$f_A(-2,1,-4) = \begin{bmatrix} -1 & 4 & -2 \\ -5 & 3 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 1 \\ -4 \end{bmatrix} = \begin{bmatrix} 2+4+8 \\ 10+3-4 \end{bmatrix} = \begin{bmatrix} 14 \\ 9 \end{bmatrix}$$

B2(a) The domain of f_A is $\mathbb{R}^3$, because A has 3 columns. The codomain of f_A is $\mathbb{R}^4$, because A has 4 rows.

B2(b) $f_A(-4,2,1) = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 3 \\ 5 & 7 & 9 \\ 2 & 4 & 3 \end{bmatrix} \begin{bmatrix} -4 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -8+2+0 \\ 0+4+3 \\ -20+14+9 \\ -8+8+8 \end{bmatrix} = \begin{bmatrix} -6 \\ 7 \\ 3 \\ 8 \end{bmatrix}$

$$f_A(3,-3,2) = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 3 \\ 5 & 7 & 9 \\ 2 & 4 & 3 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \\ 2 \end{bmatrix} = \begin{bmatrix} 6-3+0 \\ 0-6+6 \\ 15-21+18 \\ 6-12+6 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \\ 12 \\ 0 \end{bmatrix}$$