Solution to Practice 1q

A3(a) First, we calculate that $\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} \times \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix} = \begin{bmatrix} (2)(-1)-(1)(3) \\ (1)(2)-(-1)(1) \\ (1)(3)-(2)(2) \end{bmatrix} = \begin{bmatrix} -5 \\ 3 \\ -1 \end{bmatrix}$. Then the area of the parallelogram is $||\vec{u}\times\vec{v}|| = \sqrt{(-5)^2+3^2+(-1)^2} = \sqrt{35}$.

A3(b) First, we calculate that $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \times \begin{bmatrix} 1 \\ 1 \\ 4 \end{bmatrix} = \begin{bmatrix} (0)(4)-(1)(1) \\ (1)(1)-(1)(4) \\ (1)(1)-(0)(1) \end{bmatrix} = \begin{bmatrix} -1 \\ -3 \\ 1 \end{bmatrix}$. Then the area of the parallelogram is $||\vec{u}\times\vec{v}|| = \sqrt{(-1)^2+(-3)^2+1^2} = \sqrt{11}$.

A3(c) First, we calculate that $\begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix} \times \begin{bmatrix} -2 \\ 5 \\ 0 \end{bmatrix} = \begin{bmatrix} (2)(0)-(0)(5) \\ (0)(-2)-(1)(0) \\ (1)(5)-(2)(-2) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 9 \end{bmatrix}$. Then the area of the parallelogram is $||\vec{u}\times\vec{v}|| = \sqrt{(0^2+0^2+9^2} = 9$.

A3(d) First, we calculate that $\begin{bmatrix} -3 \\ 1 \\ 0 \end{bmatrix} \times \begin{bmatrix} 4 \\ 3 \\ 0 \end{bmatrix} = \begin{bmatrix} (1)(0)-(0)(3) \\ (0)(4)-(-3)(0) \\ (-3)(3)-(1)(4) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ -13 \end{bmatrix}$. Then the area of the parallelogram is $||\vec{u}\times\vec{v}|| = \sqrt{(0^2+0^2+(-13)^2} = 13$.