Samples **Matrix Arithmetic**

1. (a) Evaluate

$$\begin{pmatrix} 5 & 7 & 9 \\ 1 & 4 & 8 \\ 5 & 1 & -5 \end{pmatrix} \begin{pmatrix} -28 & 44 & 20 \\ 45 & -70 & -31 \\ -19 & 30 & 13 \end{pmatrix}.$$

(b) Use Part (a) to calculate

$$\begin{pmatrix} 5 & 7 & 9 \\ 1 & 4 & 8 \\ 5 & 1 & -5 \end{pmatrix}^{-1}.$$

(c) Use Part (b) to solve the following three simultaneous equations

$$\begin{aligned} 5x + 7y + 9z &= -1 \\ x + 4y + 8z &= 6 \\ 5x + y - 5z &= 8 \end{aligned}$$

2. (a) Evaluate

$$\begin{pmatrix} -8 & -3 & -4 \\ -4 & 5 & 2 \\ 0 & 8 & 5 \end{pmatrix} \begin{pmatrix} 9 & -17 & 14 \\ 20 & -40 & 32 \\ -32 & 64 & -52 \end{pmatrix}.$$

(b) Use Part (a) to calculate

$$\begin{pmatrix} -8 & -3 & -4 \\ -4 & 5 & 2 \\ 0 & 8 & 5 \end{pmatrix}^{-1}.$$

(c) Use Part (b) to solve the following three simultaneous equations

$$\begin{aligned} -8x - 3y - 4z &= -3 \\ -4x + 5y + 2z &= -6 \\ 8y + 5z &= -6 \end{aligned}$$

3. (a) Evaluate

$$\begin{pmatrix} 2 & 3 & -1 \\ 4 & 7 & 8 \\ -5 & -7 & 8 \end{pmatrix} \begin{pmatrix} 112 & -17 & 31 \\ -72 & 11 & -20 \\ 7 & -1 & 2 \end{pmatrix}.$$

(b) Use Part (a) to calculate

$$\begin{pmatrix} 2 & 3 & -1 \\ 4 & 7 & 8 \\ -5 & -7 & 8 \end{pmatrix}^{-1}.$$

(c) Use Part (b) to solve the following three simultaneous equations

$$\begin{aligned} 2x + 3y - z &= 7 \\ 4x + 7y + 8z &= 7 \\ -5x - 7y + 8z &= 8 \end{aligned}$$