Section 3: Matrices and simultaneous equations

Exercise level 1

1. (i) Find the inverse of the matrix $\mathbf{M} = \begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix}$

   (ii) Use this inverse to solve the simultaneous equations

   $$2x + 3y = 8$$
   $$x - y = -1$$

2. Find the values of a for which the simultaneous equations

   $$ax + 8y = 1$$
   $$2x + ay = 3$$

   do not have a unique solution.

3. (i) Given that $\mathbf{A} = \begin{pmatrix} -3 & 2 & -1 \\ 2 & -1 & 3 \\ -1 & 1 & 1 \end{pmatrix}$, use your calculator to find $\mathbf{A}^{-1}$.

   (ii) Hence find values of x, y and z satisfying

   $$-4x - 3y + 5z = 3$$
   $$-5x - 4y + 7z = 4$$
   $$x + y - z = 0$$

4. The matrix equation $\begin{pmatrix} 3 & 6 \\ -2 & -4 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} a \\ b \end{pmatrix}$ represents two simultaneous linear equations in x and y.

   (i) Write down the two equations.

   (ii) Calculate the determinant of $\begin{pmatrix} 3 & 6 \\ -2 & -4 \end{pmatrix}$. What does this tell you about the solution of the equations in part (i)?

