6.

$$\mathbf{A} = \begin{pmatrix} 2p & 3q \\ 3p & 5q \end{pmatrix}$$

where p and q are non-zero real constants.

(a) Find $\mathbf{A}^{-1}$ in terms of p and q.

(3)

Given $\mathbf{XA} = \mathbf{B}$, where

$$\mathbf{B} = \begin{pmatrix} p & q \\ 6p & 11q \\ 5p & 8q \end{pmatrix}$$

(b) find the matrix $\mathbf{X}$, giving your answer in its simplest form.

(4)

(Total for Question 6 is 7 marks)

7.

$$\mathrm{f}(x) = 30 + \frac{7}{\sqrt{x}} - x^5 \qquad x > 0$$

The only real root, α, of the equation $\mathrm{f}(x) = 0$ lies in the interval $[2, 2.1]$.

(a) Starting with the interval $[2, 2.1]$, use interval bisection twice to find an interval of width 0.025 that contains α.

(4)

(b) Find $\mathrm{f}'(x)$.

(2)

(c) Taking 2 as a first approximation to α, apply the Newton–Raphson process once to $\mathrm{f}(x)$ to find a second approximation to α, giving your answer to 2 decimal places.

(2)

(Total for Question 7 is 8 marks)
