1 Solve the equation $|x^3 - 14| = 13$, showing all your working. [4]

2 The variables $x$ and $y$ satisfy the equation $y = A(b^x)$, where $A$ and $b$ are constants. The graph of $\ln y$ against $x$ is a straight line passing through the points $(0, 2.14)$ and $(5, 4.49)$, as shown in the diagram. Find the values of $A$ and $b$, correct to 1 decimal place. [5]

3 The polynomial $p(x)$ is defined by

$$p(x) = ax^3 - 3x^2 - 5x + a + 4,$$

where $a$ is a constant.

(i) Given that $(x - 2)$ is a factor of $p(x)$, find the value of $a$. [2]

(ii) When $a$ has this value,

(a) factorise $p(x)$ completely, [3]

(b) find the remainder when $p(x)$ is divided by $(x + 1)$. [2]

4 (i) Given that $35 + \sec^2 \theta = 12 \tan \theta$, find the value of $\tan \theta$. [3]

(ii) Hence, showing the use of an appropriate formula in each case, find the exact value of

(a) $\tan(\theta - 45^\circ)$, [2]

(b) $\tan 2\theta$. [2]
The diagram shows the curve \( y = 4e^{\ln x} - 6x + 3 \) and its minimum point \( M \).

(i) Show that the \( x \)-coordinate of \( M \) can be written in the form \( \ln a \), where the value of \( a \) is to be stated. \([5]\)

(ii) Find the exact value of the area of the region enclosed by the curve and the lines \( x = 0 \), \( x = 2 \) and \( y = 0 \). \([4]\)

6 A curve has parametric equations

\[
x = \frac{1}{(2t + 1)^2}, \quad y = \sqrt{t + 2}.
\]

The point \( P \) on the curve has parameter \( p \) and it is given that the gradient of the curve at \( P \) is \(-1\).

(i) Show that \( p = (p + 2)^{\frac{1}{6}} - \frac{1}{2} \). \([6]\)

(ii) Use an iterative process based on the equation in part (i) to find the value of \( p \) correct to 3 decimal places. Use a starting value of 0.7 and show the result of each iteration to 5 decimal places. \([3]\)

7 (i) Show that \( (2 \sin x + \cos x)^2 \) can be written in the form \( \frac{5}{2} + 2 \sin 2x - \frac{3}{2} \cos 2x \). \([5]\)

(ii) Hence find the exact value of \( \int_{0}^{\frac{1}{2}} (2 \sin x + \cos x)^2 \, dx \). \([4]\)