6 In this question you must show detailed reasoning.

The cubic polynomial $f(x)$ is defined by $f(x) = 4x^3 - 25x^2 - 58x + 16$.

(a) Show that $x = \frac{1}{4}$ is a root of the equation $f(x) = 0$. **[1]**

(b) Hence express $f(x)$ as the product of a linear factor and a quadratic factor, with all terms in the factors having integer coefficients. **[3]**

(c) Solve the equation $4e^{3y} - 25e^{2y} - 58e^{y} + 16 = 0$, giving each root in the form $y = k\ln 2$ where k is a constant. **[4]**