

**4 In this question you must show detailed reasoning.**

The cubic polynomial  $6x^3 + kx^2 + 57x - 20$  is denoted by  $f(x)$ . It is given that  $(2x - 1)$  is a factor of  $f(x)$ .

**(a)** Use the factor theorem to show that  $k = -37$ . **[2]**

**(b)** Using this value of  $k$ , factorise  $f(x)$  completely. **[3]**

**(c) (i)** Hence find the three values of  $t$  satisfying the equation  $6e^{-3t} - 37e^{-2t} + 57e^{-t} - 20 = 0$ . **[2]**

**(ii)** Express the sum of the three values found in part **(c)(i)** as a single logarithm. **[2]**