6

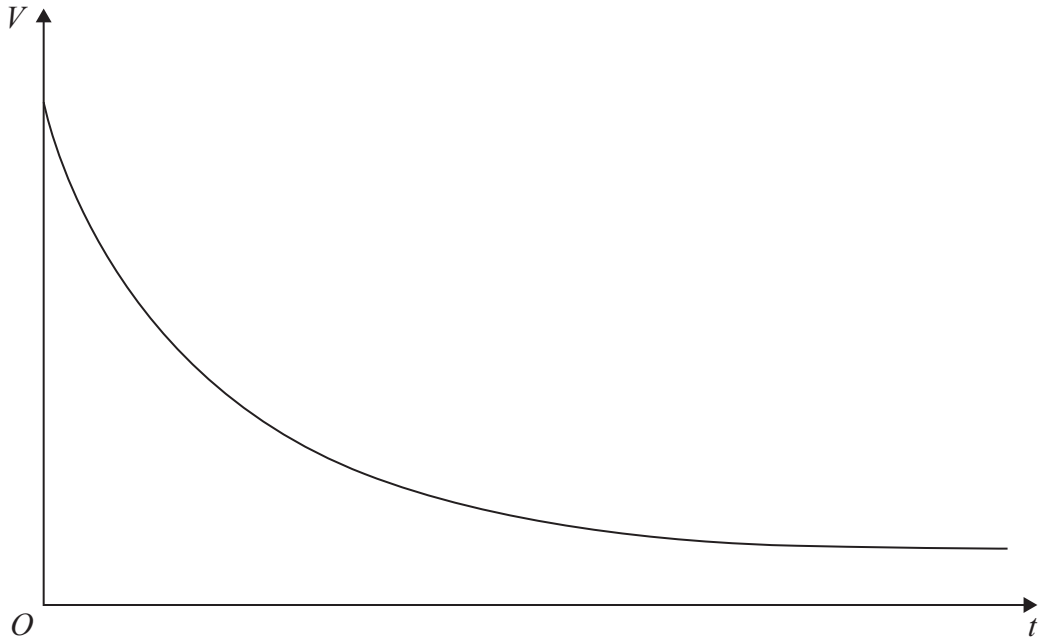

Figure 1

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

The value of a particular car is modelled by the formula

$$V = 18\,000e^{-0.2t} + 4000e^{-0.1t} + 1000 \qquad t \geqslant 0$$

where the value of the car is V pounds when the age of the car is t years.

A sketch of t against V is shown in Figure 1.

(a) State the range of V.

(2)

According to this model,

(b) find the rate at which the value of the car is decreasing when $t = 10$
Give your answer in pounds per year.

(3)

(c) Calculate the exact value of t when $V = 15\,000$ giving the answer in its simplest form.

(4)

(Total for Question 6 is 9 marks)

7. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

(a) Express $\sqrt{5}\cos\theta - 2\sin\theta$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$

State the value of R and give the value of α to 4 significant figures.

(3)

(b) Solve, for $-\pi < \theta < \pi$,

$$\sqrt{5}\cos\theta - 2\sin\theta = 0.5$$

giving your answers to 3 significant figures.

(4)

$$f(x) = A\left(\sqrt{5}\cos\theta - 2\sin\theta\right) + B \qquad \theta \in \mathbb{R}$$

where A and B are constants.

Given that the range of f is

$$-15 \leqslant f(x) \leqslant 33$$

(c) find the value of B and the possible values of A.

(4)

(Total for Question 7 is 11 marks)