9.

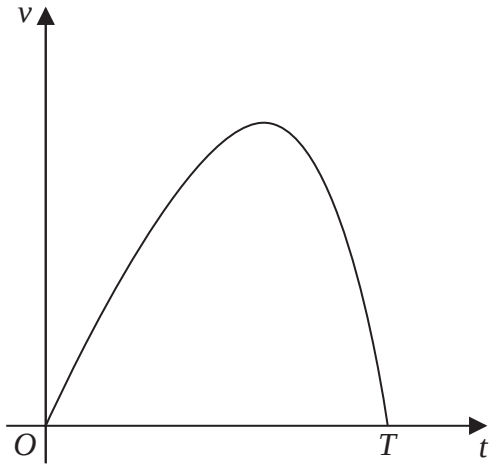

Figure 2

A racing car is driven along a straight road.

Figure 2 shows a graph of the speed of the car as it travels along the road.

The car starts from rest and is driven for T seconds before stopping.

The speed of the car is modelled by the equation

$$v = 15t - te^{0.2t} \qquad 0 \leqslant t \leqslant T$$

where t seconds is the time after the car starts to move.

According to the model,

(a) find the value of T, giving your answer to one decimal place,

(2)

(b) show that the maximum speed of the car occurs when

$$t = 5\ln\left(\frac{75}{t+5}\right)$$

(4)

Using the iteration formula

$$t_{n+1} = 5\ln\left(\frac{75}{t_n+5}\right) \qquad \text{with } t_1 = 8$$

(c) (i) find the value of t_3 to 3 decimal places,

(ii) find, by repeated iteration, the time taken for the car to reach maximum speed.

(3)