

1.(a) (i) Given,  $y = 10t - 1.86t^2$

Average velocity over given time intervals:

$$\Rightarrow \frac{y(t_2 - t_1)}{t_2 - t_1} \text{ ms}^{-1}$$

$\therefore$  On time intervals  $[1, 2]$  average velocity,

$$\begin{aligned} \Rightarrow V &= \frac{y(t_2) - y(t_1)}{t_2 - t_1} \text{ ms}^{-1} \\ &= \frac{\{10 \times 2 - 1.86 \times (2)^2\} - \{10 \times 1 - 1.86 \times (1)^2\}}{2 - 1} \\ &= \{20 - 7.44\} - \{10 - 1.86\} \\ &= 4.42 \text{ ms}^{-1} \end{aligned}$$

(ii) Average velocity over time intervals  $[1, 1.5]$

$$\begin{aligned} V &= \frac{[10 \times 1.5 - 1.86 \times (1.5)^2] - [10 \times 1 - 1.86 \times (1)^2]}{1.5 - 1} \\ &= \frac{[15 - 4.183] - [10 - 1.86]}{0.5} \\ &= \frac{[10.817] - [8.14]}{0.5} \\ &= \frac{2.677}{0.5} \\ &= 5.35 \text{ ms}^{-1} \end{aligned}$$

iii) Average velocity over time intervals  $[1, 1.1]$ ,  

$$v = \frac{[(10 \times 1.1) - 1.86 \times (1.1)^2] - [(10 \times 1) - 1.86 \times (1)^2]}{1.1 - 1}$$

$$= \frac{[11 - 2.25] - [8.14]}{0.1}$$

$= 6.134 \text{ ms}^{-1}$

iv) Average velocity over time intervals  $[1, 1.01]$ ,  

$$v = \frac{[(10 \times 1.01) - 1.86 \times (1.01)^2] - [(10 \times 1) - 1.86 \times (1)^2]}{1.01 - 1}$$

$$= 7.3714 \text{ ms}^{-1}$$

v) Average velocity over time intervals  $[1, 1.001]$ ,  

$$v = \frac{[(10 \times 1.001) - 1.86 \times (1.001)^2] - [(10 \times 1) - 1.86 \times (1)^2]}{1.001 - 1}$$

$$= 6.27914 \text{ ms}^{-1}$$