

2-a. i) Average velocity over time intervals $[1, 2]$,

$$s(1) = 2 \sin(\pi \times 1) + 3 \cos(\pi \times 1)$$

$$s(2) = 2 \sin(\pi \times 2) + 3 \cos(\pi \times 2)$$

$$\therefore \text{Average velocity} = \frac{s(2) - s(1)}{2 - 1}$$
$$= \frac{6}{1}$$

$$= 6 \text{ cm s}^{-1}$$

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

$$s(1.1) = 2 \sin(\pi \times 1.1) + 3 \cos(\pi \times 1.1)$$

$$\therefore \text{Average velocity} = \frac{s(1.1) - s(1)}{1.1 - 1}$$

$$= -4.71 \text{ cm s}^{-1}$$

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

$$s(1.01) = 2 \sin(\pi \times 1.01) + 3 \cos(\pi \times 1.01)$$

$$\begin{aligned} \text{Average velocity} &= \frac{s(1.01) - s(1)}{1.01 - 1} \\ &= -6.13 \text{ cm s}^{-1} \end{aligned}$$

~~Average velocity over time intervals.~~

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

$$s(1.001) = 2 \sin(\pi \times 1.001) + 3 \cos(\pi \times 1.001)$$

$$\begin{aligned} \therefore \text{Average velocity} &= \frac{s(1.001) - s(1)}{1.001 - 1} \\ &= -6.27 \text{ cm s}^{-1} \end{aligned}$$