

Graphs of Motion - Review

$$\begin{aligned} 1) a) \Delta d &= d_f - d_i \\ &= 7.0\text{ m} - 3.0\text{ m} \\ &= \underline{\underline{4.0\text{ m}}} \end{aligned}$$

$$\begin{aligned} b) (9.0\text{ s}, 8.0\text{ m}) \\ (7.0\text{ s}, 3.0\text{ m}) \quad v &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3.0\text{ m} - 8.0\text{ m}}{7.0\text{ s} - 9.0\text{ s}} \\ &= \frac{-5.0\text{ m}}{-2.0\text{ s}} \\ &= \underline{\underline{2.5\text{ m/s}}} \end{aligned}$$

$$\begin{aligned} c) (19\text{ s}, 0\text{ m}) \\ (17\text{ s}, 7.0\text{ m}) \quad v &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{7.0\text{ m} - 0.0\text{ m}}{17\text{ s} - 19\text{ s}} \\ &= \frac{7.0\text{ m}}{-2.0\text{ s}} \\ &= \underline{\underline{-3.5\text{ m/s}}} \end{aligned}$$

d) speed = 3.5 m/s (no direction)

$$\begin{aligned} e) \Delta d &= d_f - d_i \\ &= 7.0\text{ m} - 10.5\text{ m} \\ &= -3.5\text{ m} \end{aligned}$$

$$\begin{aligned} f) \text{ distance} &= 10\text{ m} + 6\text{ m} \\ &= 16\text{ m} \end{aligned}$$

$$\begin{aligned}
 g) \quad v_{av} &= \frac{\text{displ}}{\Delta t} \\
 &= \frac{d_f - d_i}{\Delta t} \\
 &= \frac{7\text{m} - 3\text{m}}{17\text{s} - 3\text{s}} \\
 &= \frac{4\text{m}}{14\text{s}} \\
 &= 0.286 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 h) \quad \text{Speed}_{av} &= \frac{\text{distance}}{\Delta t} \\
 &= \frac{10\text{m} + 6\text{m}}{14\text{s}} \\
 &= \frac{16\text{m}}{14\text{s}} \\
 &= 1.14 \text{ m/s}
 \end{aligned}$$

i) $[3, 7]\text{s}$ and $[14, 17]\text{s}$

$$\begin{aligned}
 j) \text{ @ } 8.0 \text{ m/s} \quad v &= \frac{8\text{m} - 3\text{m}}{9\text{s} - 7\text{s}} \\
 (9, 8), (7, 3) &= \frac{5\text{m}}{2\text{s}} \\
 &= 2.5 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 \text{② @ } 18.0 \text{ m} \quad v &= \frac{7\text{m} - 0}{17\text{s} - 19\text{s}} \\
 (17, 7), (19, 0) &= \frac{7\text{m}}{-2\text{s}} \\
 &= -3.5 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 \text{③ } a_{av} &= \frac{v_f - v_i}{\Delta t} \\
 &= \frac{-3.5 \text{ m/s} - 2.5 \text{ m/s}}{10\text{s}} \\
 &= \frac{-6.0 \text{ m/s}}{10\text{s}} \\
 &= \underline{\underline{-0.6 \text{ m/s}^2}}
 \end{aligned}$$

k) \rightarrow see last page

2) a) -1.0 m/s

b) Slope $(5, -1), (7, -3)$

$$\begin{aligned} a &= \frac{-3 \text{ m/s} - (-1 \text{ m/s})}{7 \text{ s} - 5 \text{ s}} \\ &= \frac{-2 \text{ m/s}}{2 \text{ s}} \\ &= -1 \text{ m/s}^2 \end{aligned}$$

c) $a = 0$ (constant velocity)

d) slope $(18, 3), (20, 0)$

$$\begin{aligned} a &= \frac{0 \text{ m/s} - 3 \text{ m/s}}{20 \text{ s} - 18 \text{ s}} \\ &= \frac{-3 \text{ m/s}}{2 \text{ s}} \\ &= -1.5 \text{ m/s}^2 \end{aligned}$$

e) Area $0 \rightarrow 4 \text{ s}$

$$\begin{aligned} A &= \frac{(b+B)h}{2} \\ &= \frac{(2 \text{ s} + 4 \text{ s}) 2 \text{ m/s}}{2} \\ &= 6 \text{ m} \end{aligned}$$

Area $4 \text{ s} - 7 \text{ s}$

$$\begin{aligned} A &= \frac{b \times h}{2} \\ &= \frac{3 \text{ s} \times -3 \text{ m/s}}{2} \\ &= -4.5 \text{ m} \end{aligned}$$

$$\text{displacement} = 6 \text{ m} + (-4.5 \text{ m}) = 1.5 \text{ m}$$

$$f) 7s \rightarrow 10s$$

$$\begin{aligned} A &= \frac{b \times h}{2} \\ &= \frac{3s \times -3m/s}{2} \\ &= -4.5m \end{aligned}$$

$$10s \rightarrow 15s$$

$$\begin{aligned} A &= \frac{(b+B)h}{2} \\ &= \frac{(3m/s + 5m/s)2s}{2} \\ &= 8m \end{aligned}$$

$$\text{distance} = 4.5m + 8m = 12.5m$$

$$g) v_{av} = \frac{\text{displacement}}{\Delta t}$$

$$\begin{aligned} &= \frac{6m + (-4.5m) + (-4.5m) + 8m}{15s} \\ &= \frac{5m}{15s} \\ &= 0.33 \text{ m/s} \end{aligned}$$

$$h) \text{Speed}_{av} = \frac{\text{distance}}{\Delta t}$$

$$\begin{aligned} &= \frac{6m + 4.5m + 4.5m + 8m}{15s} \\ &= \frac{21m}{15s} \\ &= 1.4 \text{ m/s} \end{aligned}$$

i) at 4.0s for an instant

" 10.0s " " "

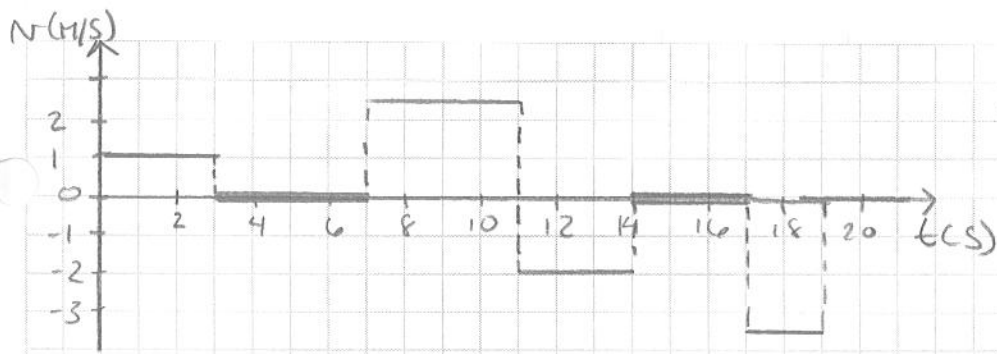
" 19.0s " " "

j) [0, 2]s, [12, 15]s

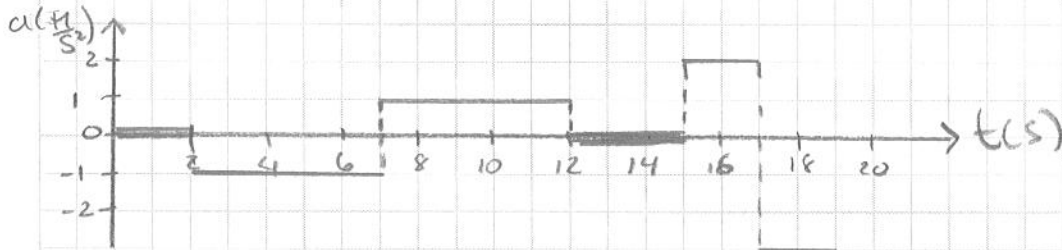
k) [2, 4]s, [7, 10]s, [17, 19]s

l) [4, 7]s, [10, 12]s, [15, 17]s

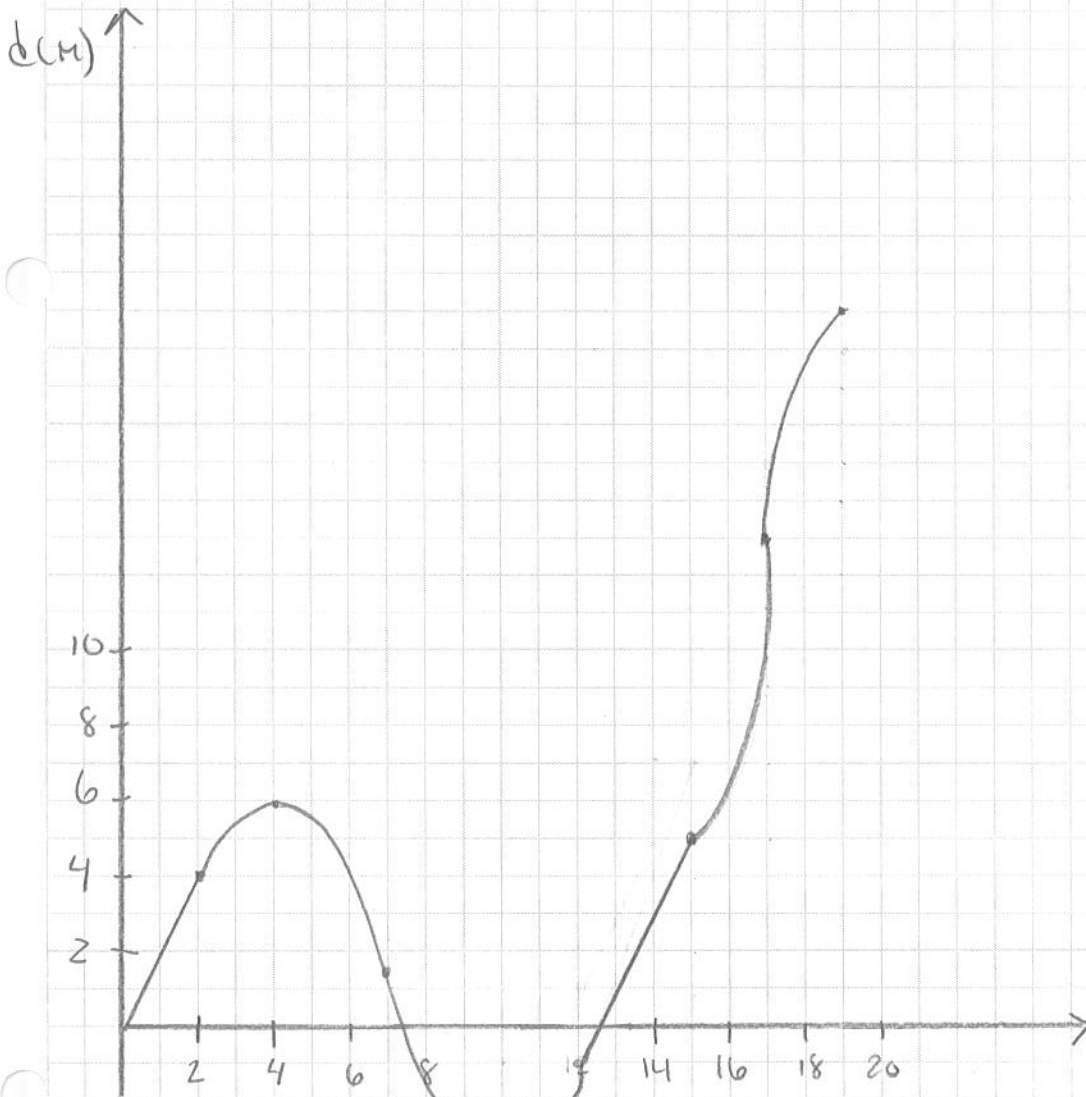
m) and n) \rightarrow see next page.



1) k)



2) m



2) n