

displacement-time
d-t, v-t, a-t graph

1. The following graphs represent trips performed in several stages. Use the graph given to construct the graph required. You may find the diagram to the right useful for remembering what you need to do.

$$d = \frac{v_i + v_f}{2} t$$

$$d = v_{avg} t$$



Remember that area is cumulative!

$$d_i = \frac{df - d_i}{t}$$

$$v_{avg} = \frac{df - d_i}{t}$$

change of position

0-1 sec:

$$v = \frac{20m[E] - 10m[E]}{1s} = 10m/s [E]$$

4-6 sec:

$$v = \frac{10m[E] - 30m[E]}{2s} = -10m/s [E]$$

$$= 10m/s [W]$$

6-10 sec:

$$v = \frac{0 - 10m/s[E]}{4} = -2.5m/s [E]$$

$$= 2.5m/s [W]$$

$v_f - v_i$

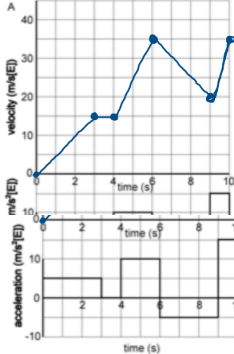
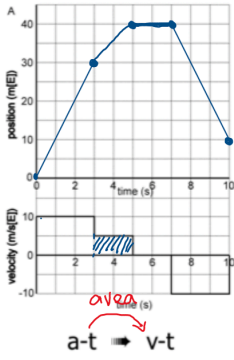
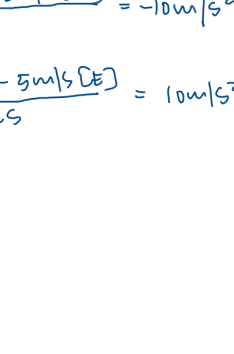
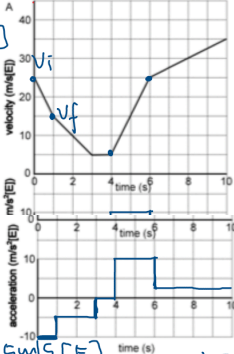
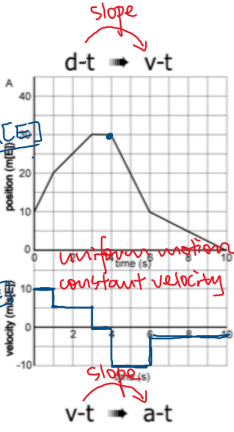
$$a = \frac{v_f - v_i}{t}$$

0-1 sec:

$$\vec{a} = \frac{15m/s[E] - 25m/s[E]}{1s} = -10m/s^2 [E]$$

4-6 sec:

$$\vec{a} = \frac{25m/s[E] - 5m/s[E]}{2s} = 10m/s^2 [E]$$



0-3 sec: $\vec{d} = 10m/s[E] \times 3s = 30m[E]$

3-5 sec: $\vec{d} = 10m[E]$

7-10 sec: $\vec{d} = -10m/s[E] \times 3s = -30m[E]$

$$a = \frac{\Delta v}{t}$$

$$\Delta v = at$$

0-3 sec: $\Delta v = 5m/s^2 [E] \times 3s = 15m/s [E]$ $v_f = 15m/s [E]$

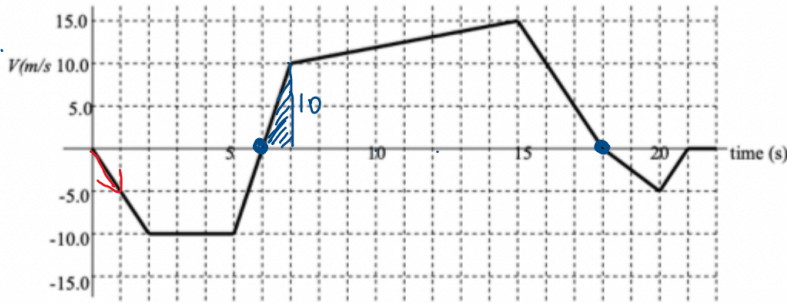
4-6 sec: $\Delta v = 20m/s [E]$ $v_f = 35m/s [E]$

6-9 sec: $\Delta v = -15m/s [E]$ $v_f = 20m/s [E]$

9-10 sec: $\Delta v = 15m/s [E]$ $v_f = 35m/s [E]$

1. The graph below describes the motion of a fly that starts out going left.

right
left



a. Identify section(s) where the fly moves with constant velocity.

2-5 sec, 21-22 sec

b. Identify section(s) where the fly moves right slowing down.

15-18 sec

c. Identify section(s) where the fly moves left speeding up.

0-2, 18-20 sec

d. When is the fly at rest?

0, 6, 18, 21-22 sec

e. What is the average velocity of the fly between 0 and 15 seconds?

$$V_{avg} = \frac{\text{displacement}}{t} = 4 \text{ m/s [Right]}$$

f. What is the distance traveled by the fly in this time interval?

$$45 \text{ m} + 5 \text{ m} + 100 \text{ m} = 150 \text{ m}$$

g. What is the average speed of the fly in the same time interval?

$$\text{speed} = \frac{\text{distance}}{t} = \frac{150 \text{ m}}{15 \text{ s}} = 10 \text{ m/s}$$

h. What is the average acceleration of the fly in this time interval?

$$a_{avg} = \frac{v_f - v_i}{t} = \frac{15 \text{ m/s [R]} - 0}{15 \text{ s}} = 1 \text{ m/s}^2 \text{ [R]}$$

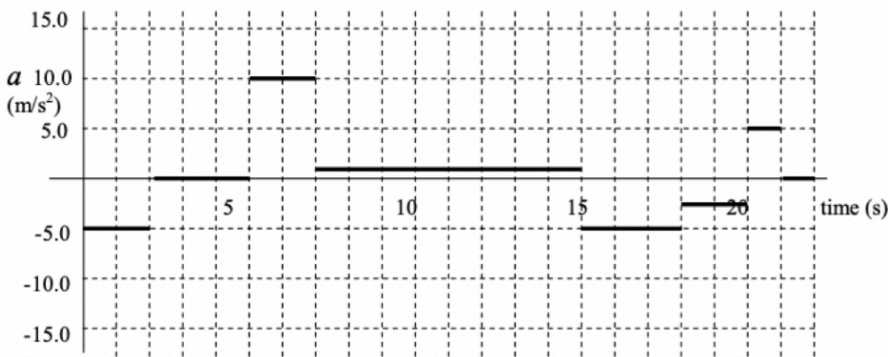
i. What is the total displacement of the fly from 0 to 22 seconds?

$$\left. \begin{array}{l} 0-15 \text{ sec: } 60 \text{ m [R]} \\ 15-22 \text{ sec: } 22.5 + (-7.5) = 15 \text{ m [R]} \end{array} \right\} 75 \text{ m [Right]}$$

j. Identify the times when the fly changes direction.

6 sec, 18 sec.

k. Draw an acceleration vs. time graph for the fly. $v-t \rightarrow a-t$



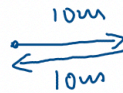
$$e: 0-6 \text{ sec: } \frac{(2^3 + 6^3)(-10 \text{ m/s})}{2^3 + 6^3} = -45 \text{ m [left]}$$

$$6-7: 5 \text{ m [Right]}$$

$$7-15: 100 \text{ m [Right]}$$

$$V_{avg} = \frac{-45 \text{ m} + 5 \text{ m} + 100 \text{ m}}{15 \text{ s}}$$

$$= 4 \text{ m/s [Right]}$$



$$d = 0$$

$$d = 20 \text{ m}$$

Watch the video [Chapter 1.1 Video](#)

2. "[Graph-that-motion](#)" animation

- Direct to the page, you will see 11 different animations. For each animations, identify the matching graph. You can answer them in any order. Once you successfully match the graph, a gold star will appear next to the button.

3. Complete worksheet

4. Textbook pg13. #1, 2; pg15. #1, 2, 3; pg16. #1, 4, 6 (Ch 1.1 [Solution](#))