

# UAPM Worksheet 4

1) a. Points B and F

slope of tangent line

=  $\emptyset$  m/s, so no velocity

b. B  $\rightarrow$  C

F  $\rightarrow$  G

slope of tangent  
line increasing

c. A  $\rightarrow$  B

E  $\rightarrow$  F

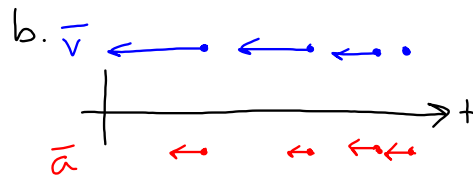
slope of tangent  
line decreasing

d. B

F

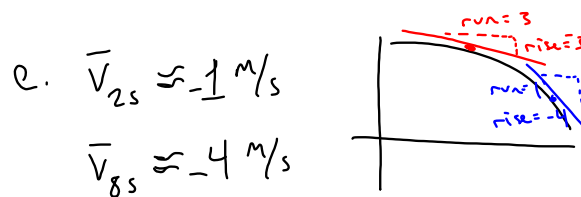
slope of tangent  
line going changing  
direction

2) a. Starts at rest, speeds up in negative direction <sup>at 25m</sup>



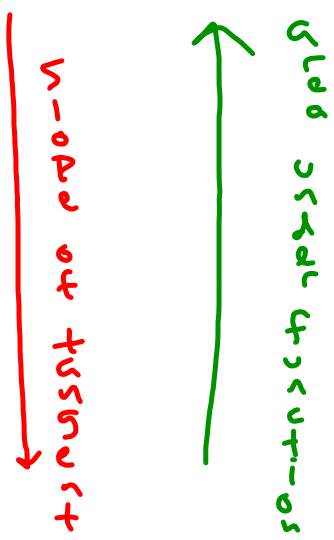
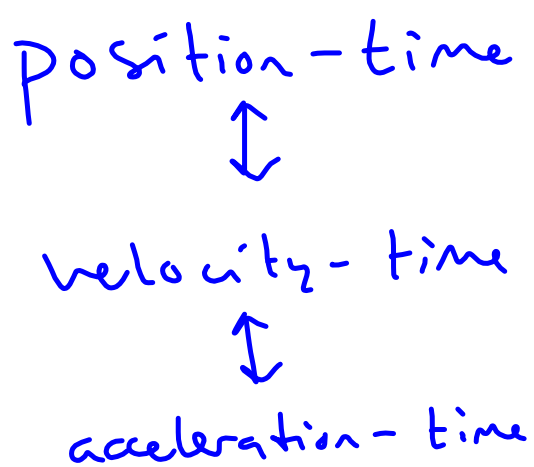
c.  $\Delta \bar{x} = x_f - x_i$   
 $= 9\text{ m} - 24\text{ m}$   
 $= -15\text{ m}$

d.  $\bar{v} = \frac{\Delta x}{\Delta t}$   
*average*  
 $= \frac{-15\text{ m}}{8\text{ s} - 2\text{ s}}$   
 $= -2.5\text{ m/s}$



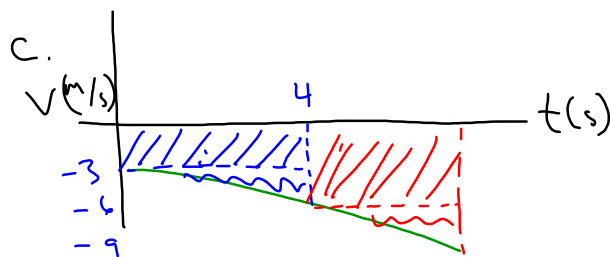
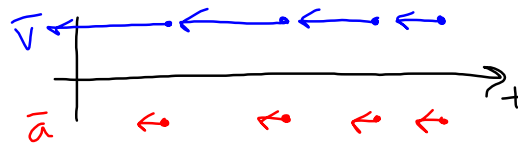
f.  $\bar{a} = \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_{8\text{s}} - \bar{v}_{2\text{s}}}{t_{8\text{s}} - t_{2\text{s}}}$   
 $= \frac{-4\text{ m/s} - (-1\text{ m/s})}{8\text{ s} - 2\text{ s}}$   
 $= -0.5\text{ m/s}^2$

g. Midpoint of 2s and 8s,  
 So instantaneous velocity  
 is close (or same!) as  
 average velocity.



3. a. At  $t = 0$  s the object is moving at  $-3$  m/s. It then speeds up for the next 8 s.

b.



$$\Delta \bar{x} = (-3 \text{ m/s})(4 \text{ s}) + \frac{1}{2}(-3 \text{ m/s})(4 \text{ s})$$

$t = 0 \text{ s}$  to  $4 \text{ s}$

$$= -18 \text{ m}$$

rectangle + triangle

d. Same process

$$\Delta \bar{x} = -30 \text{ m}$$

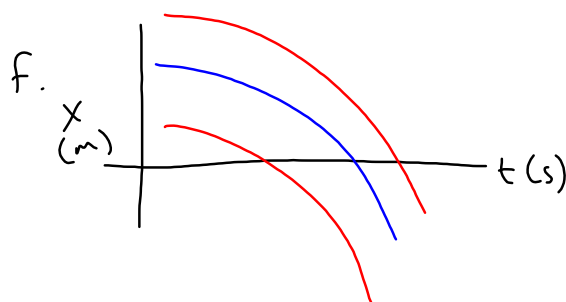
$$t = 4 \text{ s to } 8 \text{ s}$$

e.

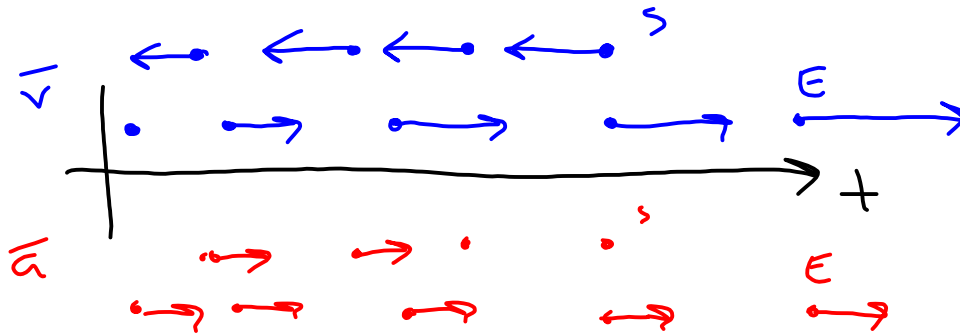
$$a = \frac{\Delta v}{\Delta t}$$

$$= \frac{-9 \text{ m/s} - (-3 \text{ m/s})}{8 \text{ s} - 0 \text{ s}}$$

$$= -0.75 \text{ m/s}^2$$



4. b.



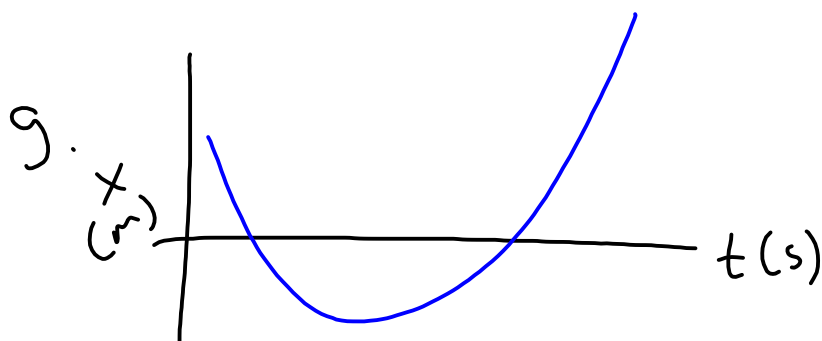
c.  $\Delta \bar{x} = -12 \text{ m}$   
 $t = 0 \text{ s to } 4 \text{ s}$

A velocity-time graph with velocity (v) on the vertical axis and time (t) on the horizontal axis. A blue curve is zero from t = 0 to t = 2 s. From t = 2 s to t = 4 s, the curve increases linearly. The area under the curve from t = 0 to t = 4 s is shaded red. A vertical dashed line is drawn at t = 2 s, and a horizontal dashed line is drawn from the curve at t = 4 s to the vertical axis, where it is labeled '-4'. The label 'E' is placed at the end of the horizontal axis.

d.  $\Delta \bar{x} = 16 \text{ m}$   
 $t = 4 \text{ s to } 8 \text{ s}$

e.  $\Delta \bar{x} = 0 \text{ m}$   
 $t = 2 \text{ s to } 6 \text{ s}$

f.  $\bar{a} = 2 \text{ m/s}^2$



$$\Delta x = x_f - x_i$$

$$\bar{v} = \frac{\Delta \bar{x}}{\Delta t} = \frac{\bar{x}_f - \bar{x}_i}{t_f - t_i}$$

$$\bar{a} = \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_f - \bar{v}_i}{t_f - t_i}$$