UAPM Worksheet 4

1) a. Points B and F

slope of tangent line
= 0 m/s, so no velocity

b. B → C
F → G

slope of tangent line increasing

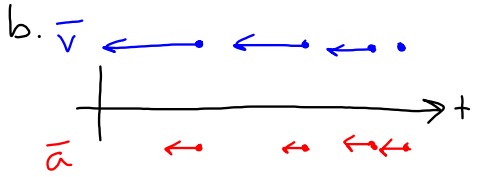
c. A → B
E → F

slope of tangent line decreasing

d. B
F

slope of tangent line going changing direction

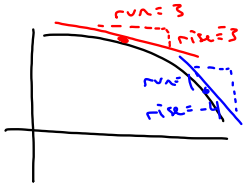
2) a. Starts at rest, speeds up in negative direction (at 25 m)

b. 

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

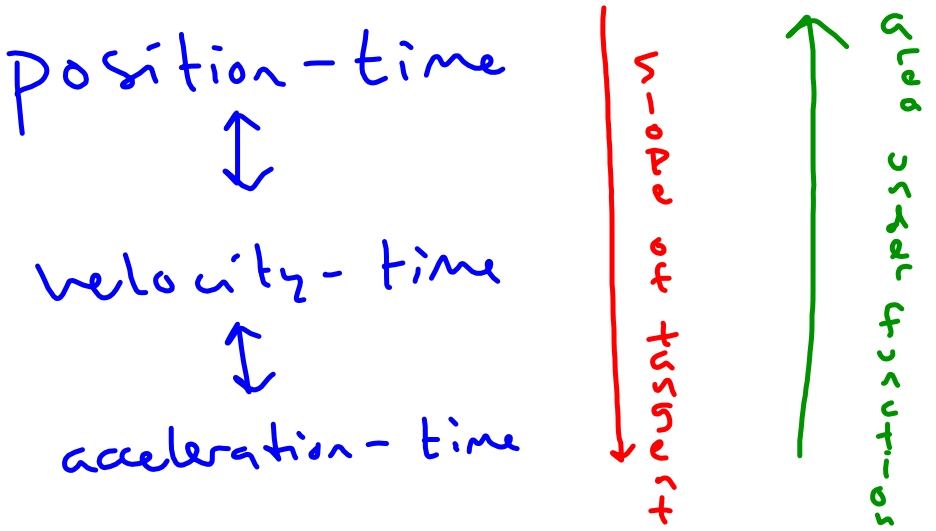
d. $\bar{v} = \frac{\Delta x}{\Delta t}$ (average)
$= \frac{-15\,m}{8\,s - 2\,s}$
$= -2.5\,m/s$

e. $\bar{v}_{2s} \approx -1\,m/s$
$\bar{v}_{8s} \approx -4\,m/s$



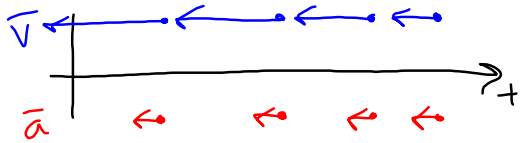
f. $\bar{a} = \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_{8s} - \bar{v}_{2s}}{t_{8s} - t_{2s}}$
$= \frac{-4\,m/s - (-1\,m/s)}{8\,s - 2\,s}$
$= -0.5\,m/s^2$

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

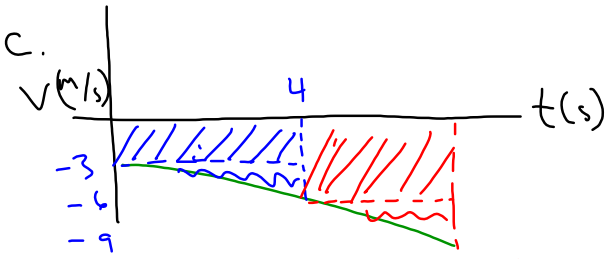

position - time
velocity - time
acceleration - time
slope of tangent
area under function

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

b.



c.



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

rectangle triangle

$t = 0$ s to 4 s $= -18$ m

d. Same process

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

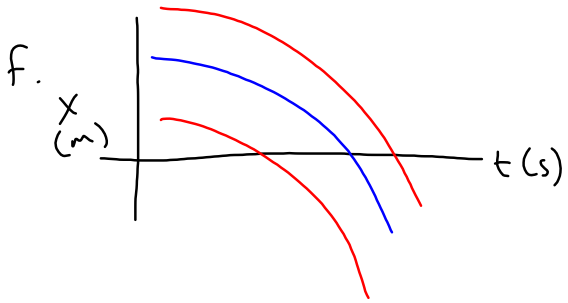
$t = 4$ s to 8 s

e. $a = \dfrac{\Delta \bar{v}}{\Delta t}$

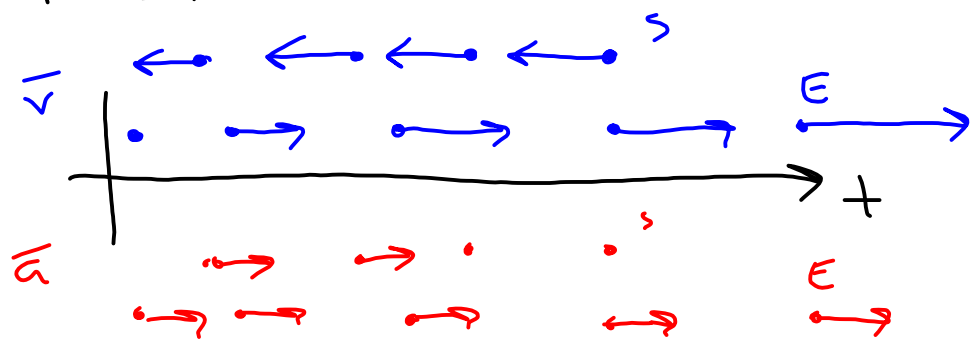
$= \dfrac{-9\ m/s - (-3\ m/s)}{8\ s - 0\ s}$

$= -0.75\ m/s^2$

f.

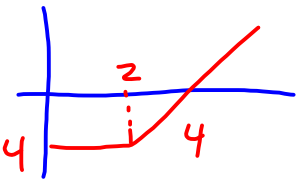


4. 6.



c. $\Delta \bar{x} = -12$ m

$t = 0$ s to 4s



d. $\Delta \bar{x} = 16$ m

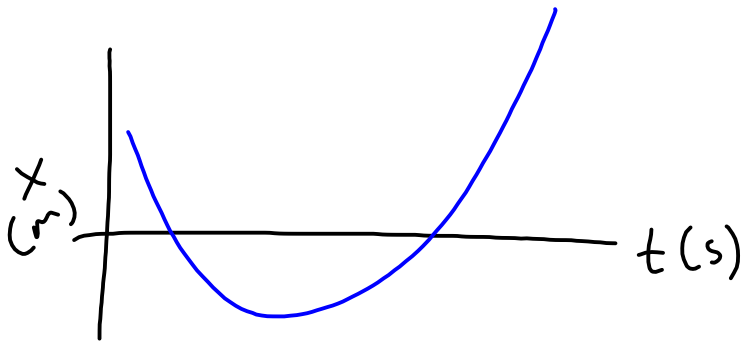
$t = 4$s to 8s

e. $\Delta \bar{x} = 0$ m

$t = 2$s to 6s

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

g.



$$\Delta x = x_f - x_i$$

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

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