M-GP General Physics Week 7 10/24

Acceleration — rate of change of velocity

$$\frac{V_f - V_i}{t_f - t_i} = \frac{\Delta V}{\Delta t}$$

acceleration = $0\ m/s^2$ constant velocity

acceleration = $\boxed{-2\ m/s^2}$ slowing down (if positive means forward)

$10\ m/s$ $8\ m/s$ $6\ m/s$

$0s$ $1\ sec$ $2\ sec$

$80\ mi/hr$ $80\ mi/hr^2 = 80\ mi/hr/hr$

$12\ m/s$ w/acceleration $\boxed{4\ m/s^2}$ or $4\ m/s/s$

$t = 0$ $t = 1s$ $t = 2s$ $t = \boxed{3s}$

V $12\ m/s$ $16\ m/s$ $20\ m/s$ $24\ m/s$

$+4\ m/s$ (1) $+4\ m/s$ (2) $+4\ m/s$ (3)

$t = 10s$

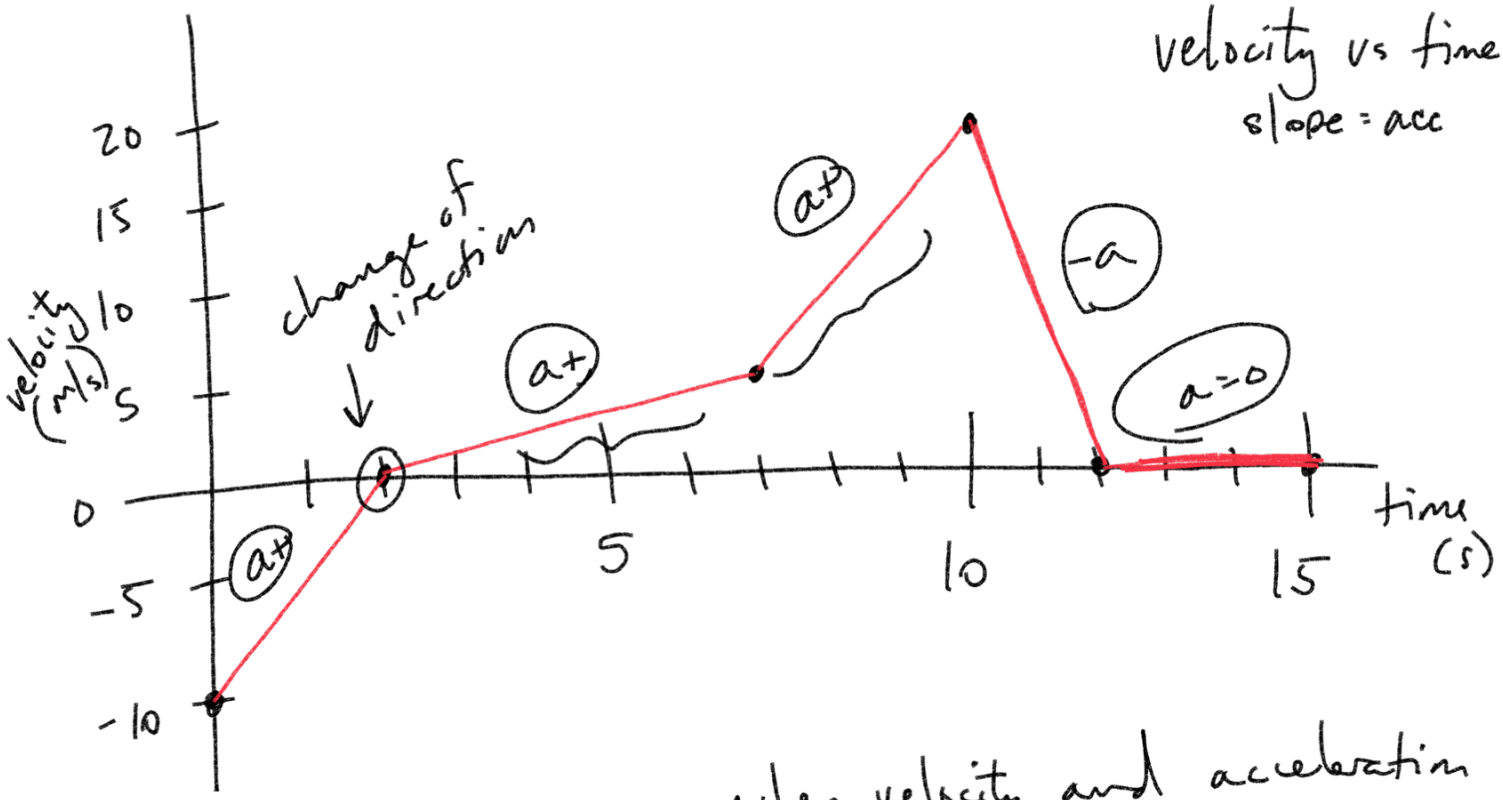
$V_f = V_i + at$

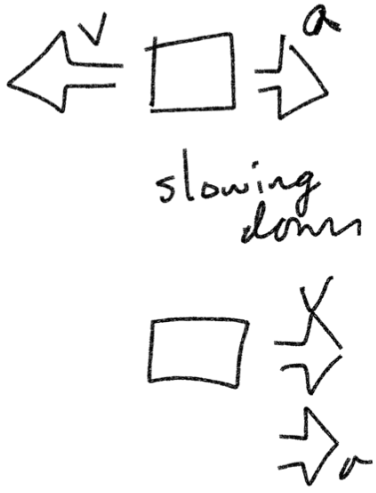
$12\ m/s + 4\ m/s^2 (10s)$

a t

$12\ m/s + 40\ m/s = \boxed{52\ m/s}$

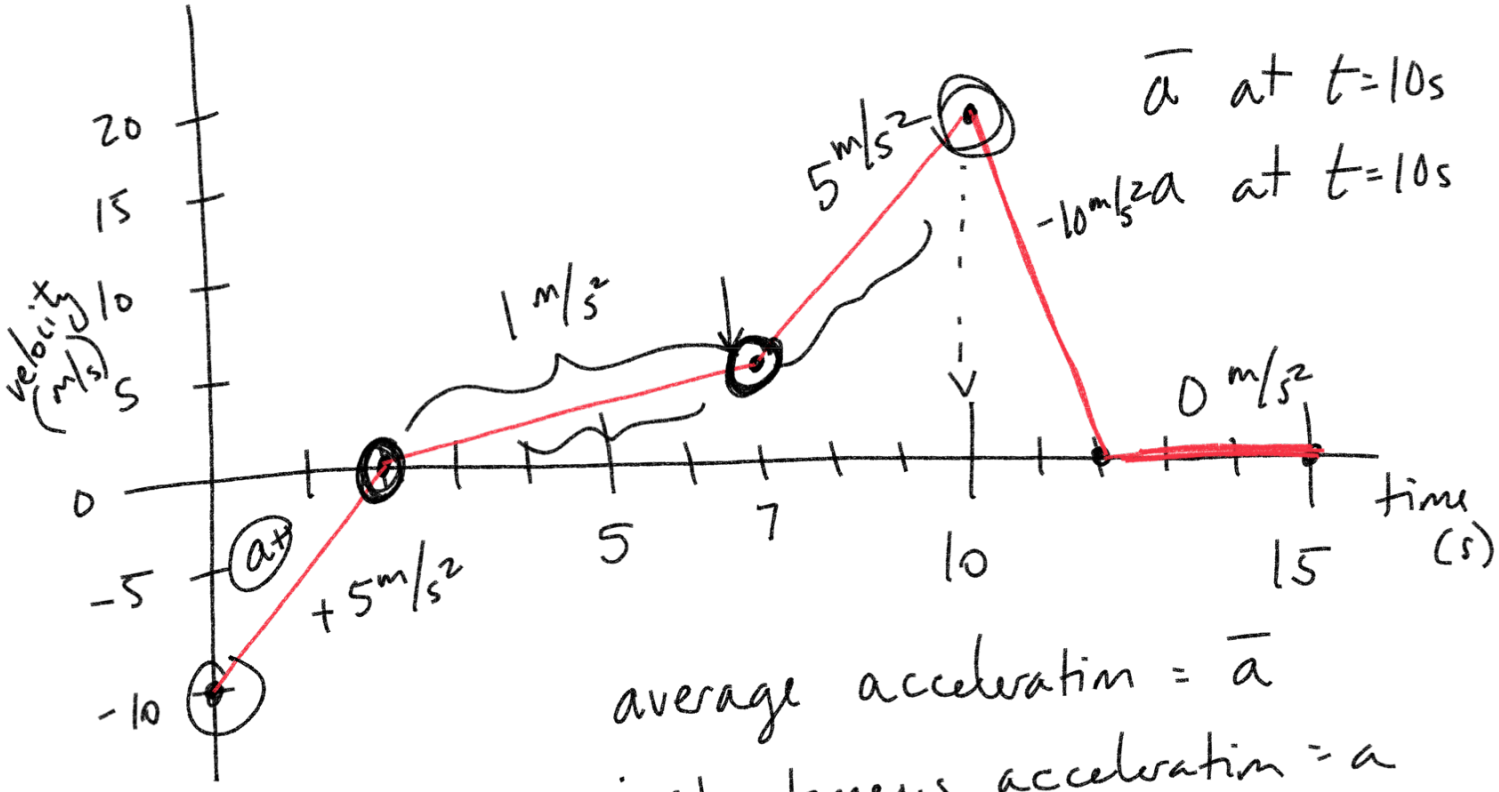
velocity vs time
slope = acc





when velocity and acceleration vectors go in opposite directions, slow down

when velocity and acceleration vectors go in the same direction, speed up



$\bar{a}$ at $t=10s$

a at $t=10s$

average acceleration = $\bar{a}$

instantaneous acceleration = a

Find $\bar{a}$ at $t=7s$ $\quad \frac{v_f - v_i}{t_f - t_i} = \frac{5\,m/s - (-10\,m/s)}{7s - 0s}$

$\frac{15\,m/s}{7s} = \boxed{\frac{15}{7}\,m/s^2}$

Find a at $t=7s$

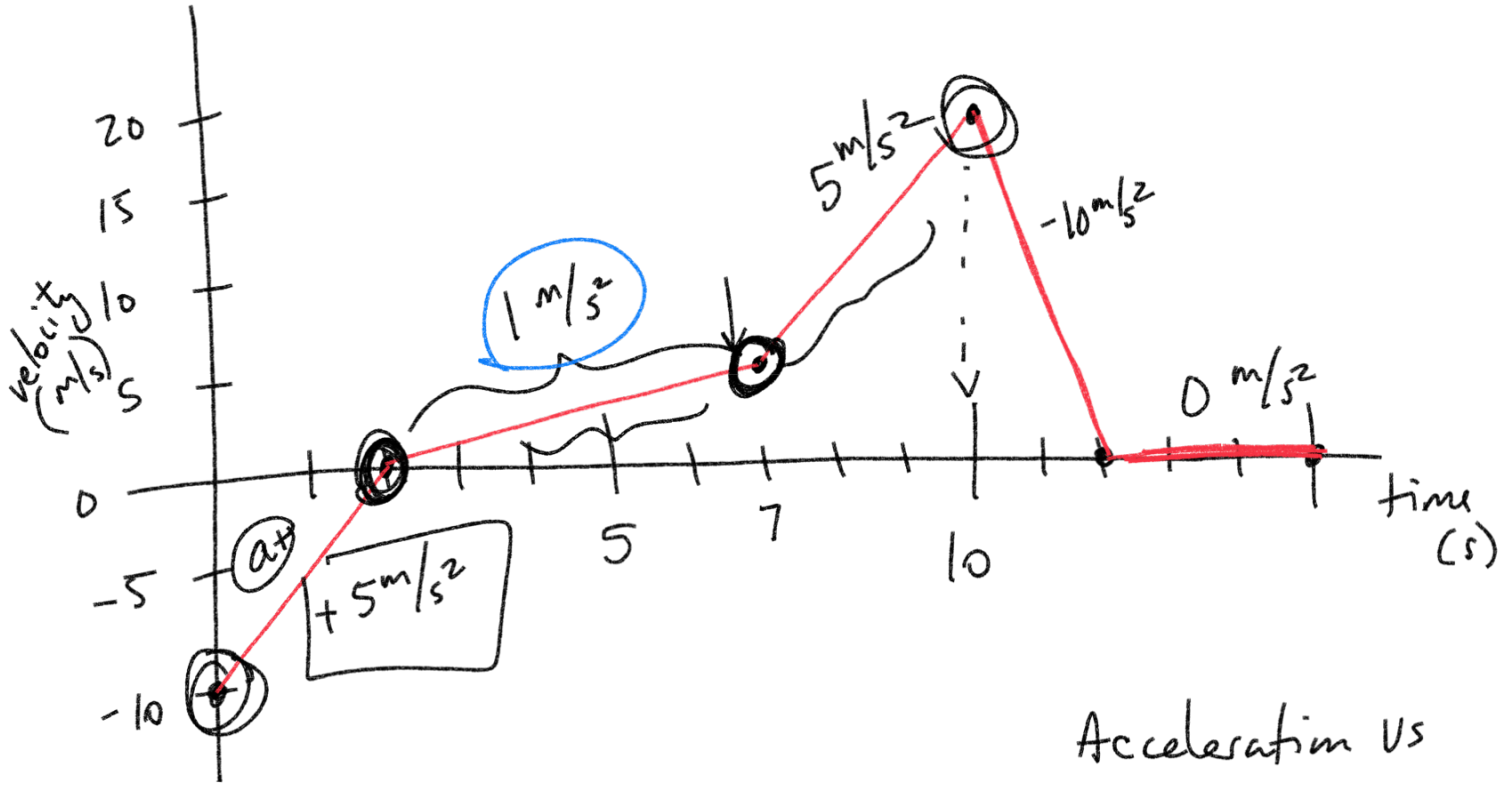
$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} \quad \frac{v_f - v_i}{t_f - t_i} = \frac{5\,m/s - 0\,m/s}{7s - 2s}$

$\frac{5\,m/s}{5s} = 1\,m/s^2$

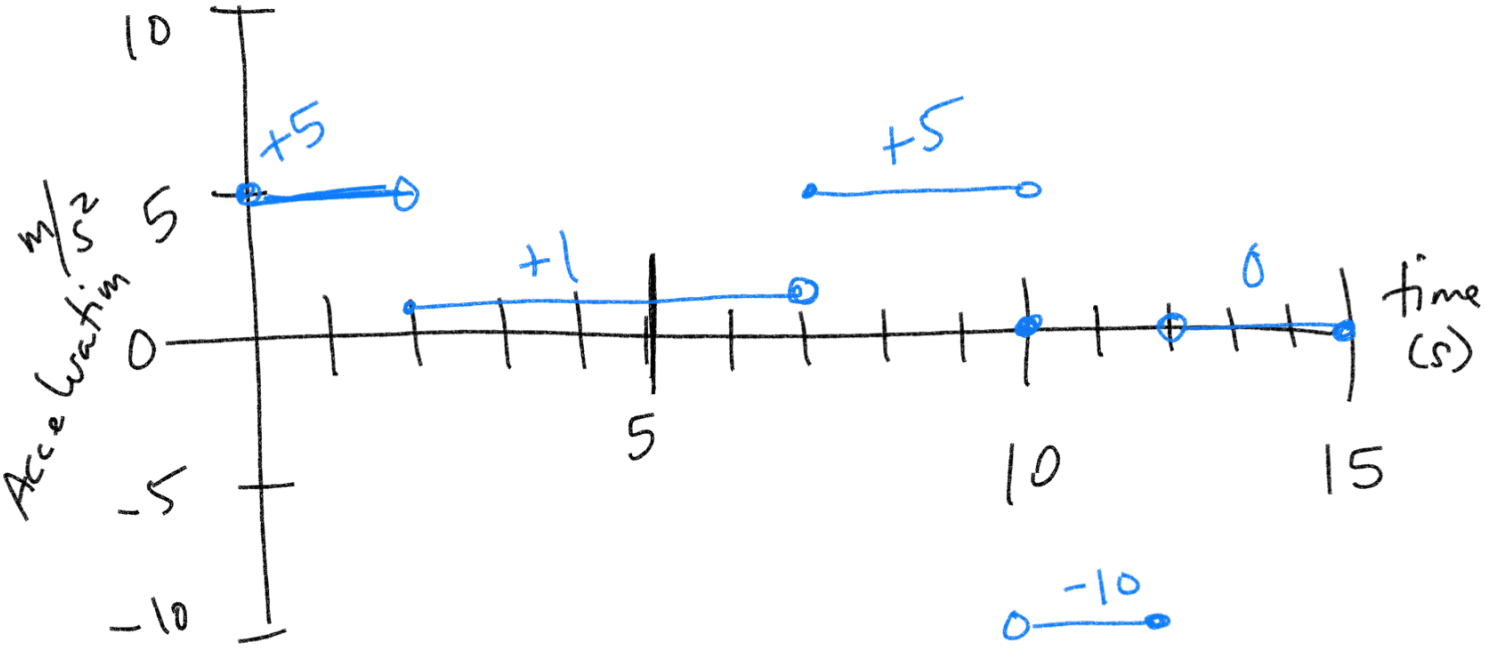
$\bar{a}$ @ $t=10s$ $\quad \frac{v_f - v_i}{t_f - t_i} = \frac{20\,m/s - (-10\,m/s)}{10s - 0s}$

$\frac{30\,m/s}{10s} = \boxed{3\,m/s^2}$

a @ $t=10s$ $\quad \boxed{0\,m/s^2}$



Acceleration vs time



Position: $-10x^{2} + 25x + 100$

(2 → 1, 1 → 1−1)

calculus term for slope is Derivative

1st derivative = slope

Velocity: $-20x + 25$

$\frac{\Delta x}{\Delta t}$ $t = 1.25\,s$ $\quad -20(1.25) + 25$

$-25 + 25 = 0$

2nd derivative

$t = 4.65\,s$

$-20x^{1} + 25$ $\quad -20(4.65) + 25$

Acceleration

$-20\ m/s^{2}$

$-93 + 25 = -68\ m/s$