Physics 1c.

HW 3.

N1. (1c.) $v_0 = 0$

$\downarrow$

v_f

$$v_f = g \cdot t = 9.8 \frac{m}{s^2} \cdot 5s \simeq 50 \frac{m}{s}$$

N2.

$$v_f = 60\ mph \simeq 27 \frac{m}{s} \simeq 96 \frac{km}{h}$$

$$v_f = 0 + a \cdot t \Rightarrow a = \frac{v_f}{t}$$

$$\boxed{a \simeq 12 \frac{m}{s^2}} \qquad \boxed{a > g}$$

$\longrightarrow x$

$$a = -4 \frac{m}{s^2} \Rightarrow$$

$$0 = 27 \frac{m}{s} - 4 \cdot \frac{m}{s^2} \cdot t$$

$$\Rightarrow t = \frac{27}{4} \frac{m/s}{m/s^2} = 6.75\ s.$$

N3.

$\downarrow 5m.$

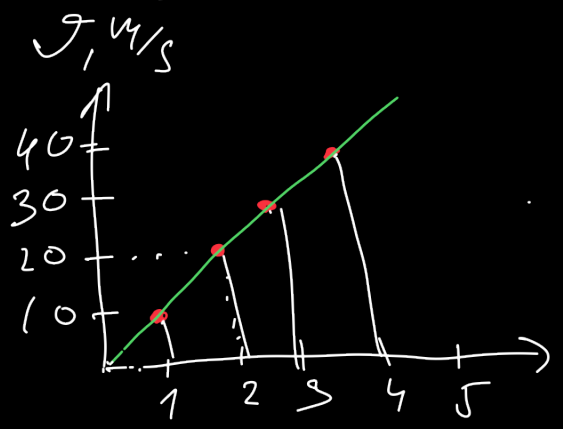
$$\vec{v}_{av.} = \frac{5m}{1s.} = 5 \frac{m}{s}.$$

$$\vec{v}_f = g \cdot t \simeq 10 \frac{m}{s}$$

$$\boxed{\vec{v}_{av} = \frac{\vec{v}_f + \vec{v}_0}{2.}}$$

only when $\vec{a} = const.$

Constant acceleration and displacement



$v_{avg} = 20 \frac{m}{s}$

$\vartheta = 0 + a \cdot t$

$\boxed{\vartheta = g \cdot t}$

$\vartheta_{avg.} = \frac{0+40}{2} \frac{m}{s}$

$\vartheta_0 = 0.$

$\vec{v}_{avg.} = \frac{v_f + \vartheta_0}{2}$; $t.$

$\vec{v}_{avg} = \frac{\text{total displ.}}{\text{total time}} = \frac{\vec{d}}{t}.$

$\boxed{\vec{d} = t \cdot \vec{v}_{avg.}}$

$d > 0$: right
$d < 0$: left.

$\boxed{d = t \cdot v_{avg.}}$ ← Rectilinear motion

$$\boxed{d = t \cdot v_{avg.}} \leftarrow v_{avg.} = \frac{v_0 + v_f}{2}$$

$$\boxed{v_f = v_0 + a \cdot t}$$

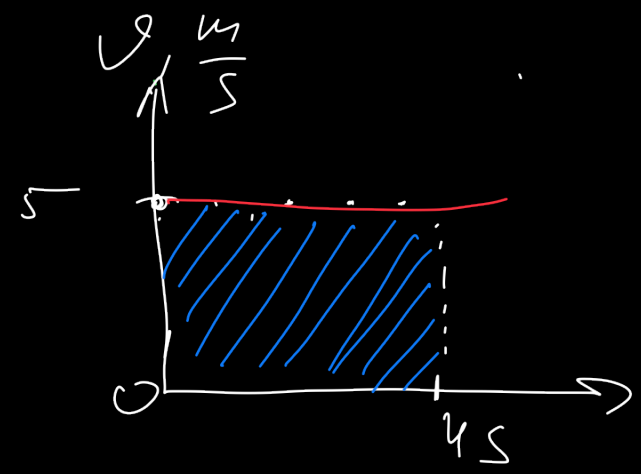
if $v_0 = 0$: $\boxed{d = t \cdot \frac{v_f}{2}}$

$$v_f = a \cdot t$$

$$\Rightarrow \boxed{d = \frac{a t^2}{2}}$$

$$v_{avg} = \frac{v_0 + v_0 + at}{2} = v_0 + \frac{at}{2}$$

$$\Rightarrow \boxed{d = v_0 \cdot t + \frac{a t^2}{2}}$$



$v = \text{const}$.

$d = 5\frac{m}{s} \cdot 4\,s$

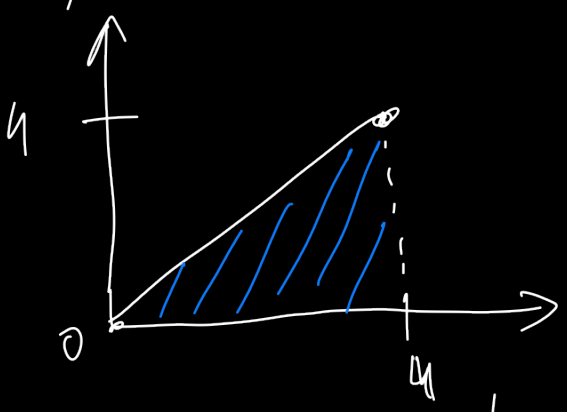
$= 20\,m$.

$d = v \cdot t$

Area: $4 \cdot 5_m = 20\,m$.

$$\boxed{d = \text{Area}}$$

true, even if $\vec{a} \neq \text{const}$.



$v = a \cdot t$

$a = 1\frac{m}{s^2}$

$$\text{Area} = \frac{1}{2} \cdot h \cdot b = \frac{1}{2} v_f \cdot t.$$

$$\boxed{\text{Area} = \frac{1}{2} a t^2 = d.}$$

Ex. Explore a cave.

$$\boxed{d = \frac{g t^2}{2}} \qquad v_0 = 0$$

$t = 3$ sec. to fall.

$$\boxed{d = \frac{10 \cdot 9 \frac{m}{s^2} \cdot s^2}{2} = 45\,m}$$

Ex. 2 Measure gravitational acceleration yourself.