SPH4U-R WS #3

1.) a) $a = 5.0\,m/s^2$ ↓
$V_1 = \emptyset$
$t = 10s$

$V_2 = V_1 + at$
$= (5)(10)$
$\boxed{V_2 = 50\,m/s}$

b) $a = 5.0\,m/s^2$ ↓
$V_1 = \emptyset$
$V_2 = 30\,m/s$

$V_2 = V_1 + at$
$30 = (5)t$
$\boxed{t = 6.0s}$

2.) a) $V_1 = 5.0\,m/s$ ↑
$V_2 = \emptyset$
$d = 5.0m$

$V_2^2 = V_1^2 + 2ad$
$0 = (5)^2 + 2a(5)$
$\frac{-25}{10} = a$
$\boxed{a = -2.5\,m/s^2\ [u]}$
$\underline{a}\ \ 2.5\,m/s^2\ [d]$

$d = \left(\frac{V_1 + V_2}{2}\right)t$
$5 = \left(\frac{5}{2}\right)t$
$\boxed{t = 2.0s}$

3.) $V_1 = \emptyset$ ↓
$t = 4.0s$
$a = g = 10\,m/s^2$

a) $d = V_1t + \frac{1}{2}at^2$
$= \frac{1}{2}(10)(4)^2$
$\boxed{d = 80\,m}$

b) $V_2 = V_1 + at$
$= (10)(4)$
$\boxed{V_2 = 40\,m/s}$

c) 80m in 4.0s
how far in 3.0s
↳ $d = V_1t + \frac{1}{2}at^2$
$= \frac{1}{2}(10)(3)^2$
$d = 45m$

∴ in last second
$d = 80 - 45$ or
$\boxed{d = 35m}$

4.) $V_1 = 40\,m/s$ ↑
$a = -10\,m/s^2$
$t = 6.0s$

a) $V_2 = V_1 + at$
$= 40 + (-10)(6)$
$\boxed{V_2 = -20\,m/s\ [u]}$

b) $d = V_1t + \frac{1}{2}at^2$
$= (40)(6) + \frac{1}{2}(-10)(6)^2$
$\boxed{d = 60\,m\ [u]}$

c) @ max height $V_2 = 0$
& you know
$V_1 = 40\,m/s$
& $a = -10\,m/s^2$ ↑

$V_2^2 = V_1^2 + 2ad$
$d = \frac{-V_1^2}{2a}$
$= -\frac{(40)^2}{2(-10)}$
$\boxed{d = 80\,m\ [u]}$

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5.) $d = 200\,m$, $v = 10\,m/s$ } $t = 20\,s$

$v = 5\,m/s$, $t = 10\,s$ } $d = 50\,m$

$$v_{avg} = \frac{d_{Total}}{t_{Total}} = \frac{250\,m}{30\,s}$$

$$\boxed{v_{avg} = 8.3\,m/s}$$

6.) $v_1 = \phi$

$v_2 = 2.5 \times 10^8\,m/s$

$d = 0.80\,km = 800\,m$

$$v_2^2 = v_1^{2\,\phi} + 2ad$$

$$a = \frac{v_2^2}{2d} = \frac{(2.5\times10^8)^2}{2(800)}$$

$$\boxed{a = 3.9 \times 10^{13}\,\frac{m}{s^2}}$$

$$d = \left(\frac{v_1^{\,\phi} + v_2}{2}\right)t$$

$$t = \frac{2d}{v_2} = \frac{2(800)}{2.5\times10^8}$$

$$\boxed{t = 6.4 \times 10^{-6}\,s}$$

7.) a) $a = \text{slope} = \frac{40\,m/s}{10\,s}$

$$\boxed{a = 4.0\,m/s^2}$$

b) $d = \text{area}$

$d_{police} = \frac{1}{2}(10)(40) = 200\,m$

$d_{speeder} = (10)(30) = 300\,m$

c) @ 10s speeder is 100m ahead of police

d) @ 10s police stop accelerating but are going 40m/s or 10m/s faster so gaining 10m every second

$t = \frac{d}{v} = \frac{100\,m}{10\,m/s}$ $t = 10\,s$

but 10s have already gone by so ↘

cop catches speeder at 10 + 10 or 20s