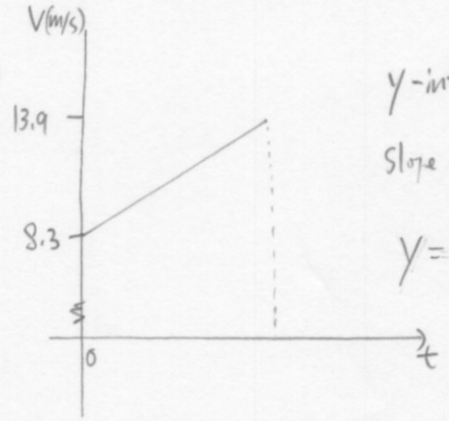
Kinematics in One Dimension
Chapter Test Review Key

1a)



y-intercept = $V_{initial} = 8.3\ m/s$

Slope of V-t = accel = $1.5\ m/s^2$

$y = mx + b$ $\quad \boxed{V = 1.5(t) + 8.3}$

b) $V_i = 8.3\ m/s$ $V_f = ?$ $t = 2$ $a = 1.5\ m/s^2$ $\quad V_f = V_i + at = 8.3 + (1.5)(2) = \boxed{11.3\ m/s}$

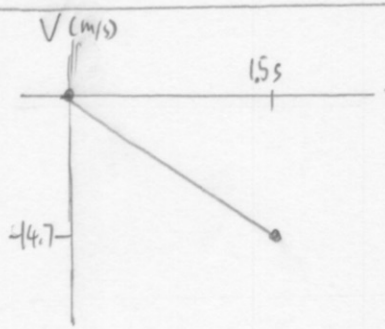
c) $d = V_i t + \frac{1}{2}at^2 = (8.3)(2) + \frac{1}{2}(1.5\ m/s^2)(2)^2 = \boxed{19.6\ m}$

d) $d = V_i t + \frac{1}{2}at^2 = 8.3(3) + \frac{1}{2}(1.5\ m/s^2)(3)^2 = \boxed{31.65\ m}$

e) $V_f = 13.9\ m/s$ $V_i = 8.3\ m/s$ $a = 1.5\ m/s^2$ $d = ?$ $\quad V_f^2 = V_i^2 + 2ad$ $\quad 13.9^2 = 8.3^2 + 2(1.5)d$ $\quad \boxed{d = 41.44\ m}$

f) $V_f = 9\ m/s$ $V_i = 8.3\ m/s$ $a = 1.5\ m/s^2$ $t = ?$ $\quad V_f = V_i + at$ $\quad 9 = 8.3 + (1.5)t$ $\quad \boxed{t = 0.467\ s}$

2a)



$V_f = V_i + at$ $\quad t = 1.5\ s$ $\quad a = -9.8$ $\quad V_i = 0$

$V_f = 0 + (-9.8)(1.5) = -14.7\ m/s$

- y-int $= 0 = V_{initial}$
- slope $= -9.8\ m/s^2$ $\quad$ Eq. $\boxed{V = -9.8(t)}$

b) $V_f = ?$ $V_i = 0$ $a = -9.8$ $(t) = 0.15\ s$ $\quad V_f = V_i + at = 0 + (-9.8)(0.15)$ $\quad \boxed{V_f = -1.47\ m/s}$

c) $d = V_i t + \frac{1}{2}at^2$ $\quad V_i = 0$ $\quad a = -9.8$ $\quad t = 0.15$ $\quad d = 0(t) + \frac{1}{2}(-9.8)(0.15)^2 = \boxed{-0.11\ m}$

d) $d = V_i t + \frac{1}{2}at^2$ $\quad t = 0.5\ s$ $\quad d = 0(t) + \frac{1}{2}(-9.8)(0.5)^2 = \boxed{-1.225\ m}$

e) $\Delta d = -5.74\ m$ $\quad a = -9.8$ $\quad V_i = 0$ $\quad V_f = ?$ $\quad V_f^2 = V_i^2 + 2ad = 0 + 2(-9.8)(-5.74)$ $\quad \boxed{V_f = 10.61\ m/s\ down}$

f) $\Delta d = -5.74\ m$ $\quad a = -9.8$ $\quad V_i = 0$ $\quad t = ?$ $\quad d = V_i t + \frac{1}{2}at^2$ $\quad -5.74 = 0 + \frac{1}{2}(-9.8)t^2$ $\quad \boxed{t = 1.08\ s}$

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3) $V_i = ?$ $\quad t = 5s$ $\quad V_f = 14\ m/s$ $\quad d = 55\ m$ $\quad a = ?$ (hard - a little)

$V_f = V_i + at$

$14 = V_i + 5a$

$V_i = 14 - 5a$

$d = V_i t + \frac{1}{2}at^2$

$(55 = V_i(5) + \frac{1}{2}a(5)^2) \div 5$

$11 = V_i + 2.5a$

$V_i = 11 - 2.5a$

$14 - 5a = 11 - 2.5a \rightarrow 3 = 2.5a$

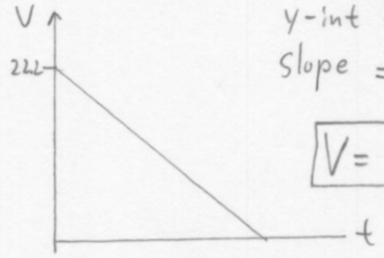
$a = 1.2\ m/s^2$

$\therefore \quad V_i = 14 - 5(1.2) = \boxed{8\ m/s}$

4) $V_i = 13.9$ $V_f = 15 m/s$ $t = 0.5$ $a = ?$ $V_f = V_i + at$ $15 = 13.9 + a(0.5)$ $\boxed{a = 2.2 m/s^2}$

5) $d = 250m$ $V_i = 8.2 m/s$ $V_f = 21 m/s$ $a = ?$ $V_f^2 = V_i^2 + 2ad$ $21^2 = 8.2^2 + 2(a)(250)$ $\boxed{a = 0.7475 m/s^2}$

6) a) $V_i = 22.2 m/s$ $a = -2 m/s^2$



y-int = $V_i = \boxed{22.2 m/s}$

slope = $\boxed{-2 m/s^2}$

$V = mx + b$

$\boxed{V = -2(t) + 22.2}$

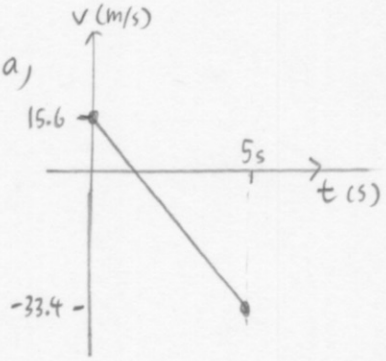
b) $V_i = 22.2 m/s$ $a = -2 m/s^2$ $t = 5s$ $V_f = V_i + at = (22.2) + (-2)(5) = \boxed{12.2 m/s}$

c) $d = V_i t + \frac{1}{2}at^2 = 22.2(5) + \frac{1}{2}(-2)(5)^2 = \boxed{86 m}$

d) $d = V_i t + \frac{1}{2}at^2 = 22.2(7) + \frac{1}{2}(-2)(7)^2 = \boxed{106.4 m}$

e) $V_f = 0$ $V_f^2 = V_i^2 + 2ad$ $0 = 22.2^2 + 2(-2)d$ $\boxed{d = 123.21 m}$

7 a)



$V_i = +15.6 m/s$ $t = 5$ $a = -9.8$ $V_f = V_i + at = 15.6 + (-9.8)(5) = -33.4 m/s$

y-int = $V_i = 15.6 m/s$

Slope = accel = $-9.8 m/s^2$

$V = -9.8(t) + 15.6$

b) $V_i = 15.6 m/s$ $a = -9.8 m/s^2$ $t = 1.2s$ $V_f = V_i + at = (15.6) + (-9.8)(1.2) = \boxed{3.84 m/s \text{ up}}$

c) $d = V_i t + \frac{1}{2}at^2 = (15.6)(1.2) + \frac{1}{2}(-9.8)(1.2)^2 = \boxed{11.664 m}$

d) $t = 1.8s$ $V_f = V_i + at = 15.6 + (-9.8)(1.8) = -2.04 m/s$ $\boxed{\text{Speed} = 2.04 m/s \text{ down}}$

e) $\Delta d = V_i t + \frac{1}{2}at^2 = (15.6)(1.8) + \frac{1}{2}(-9.8)(1.8)^2 = \boxed{12.2 m \text{ above starting pt}}$

f) $\Delta d = (15.6)(3) + \frac{1}{2}(-9.8)(3)^2 = \boxed{2.7 m \text{ above}}$

g) $\Delta d = (15.6)(5) + \frac{1}{2}(-9.8)(5)^2 = \boxed{-44.5 m \text{ below}}$

h) $V_f = 9.5 m/s$ $V_i = 15.6$ $a = -9.8 m/s^2$ $t = ?$ $V_f = V_i + at$ $9.5 = 15.6 + (-9.8)t$ $\boxed{t = 0.622s}$

i) $V_f = -9.5 m/s$ $V_f = V_i + at$ $-9.5 = 15.6 + (-9.8)(t)$ $\boxed{t = 2.56s}$

j) $V_f = 0$ $V_i = 15.6 m/s$ $a = -9.8 m/s^2$ $t = ?$ $V_f = V_i + at$ $0 = 15.6 + (-9.8)(t)$ $\boxed{t = 1.59s}$

k) $V_f = -15.6 m/s$ $V_i = 15.6 m/s$ $a = -9.8 m/s^2$ $t = ?$ $-15.6 = 15.6 + (-9.8)t$ $\boxed{t = 3.18s}$

l) $V_f = -15.6 m/s$ Same magnitude → opposite directions.