Chapt 2

3) $x = vt$

$= \left(\frac{110\text{km}}{\text{h}}\right)(2\text{s})\left(\frac{1\text{h}}{3600\text{s}}\right) = 6.11\times10^{-2}\text{ km}$

11)

a) Slope of tang: $\sim \frac{4.2\text{m}}{15\text{s}} = \sim .3\text{ m/s}$

b) Slop of tang $\sim \frac{6\text{m}}{5\text{s}} \simeq 1.2\text{ m/s}$

c) same as (a)

d) $\frac{(16-8)\text{m}}{5\text{s}} \simeq 1.6\text{ m/s}$

e) Slope $\sim \frac{(19.5-10)\text{m}}{40\text{s}-50\text{s}} \sim -.95\text{ m/s}$

17) speed ~ $\frac{\text{distance}}{\text{time}} = \frac{400\text{km}}{\text{time}}$

$$\text{time} = 1\text{ hr} + \frac{200\text{km}}{90\text{ km/hr}} + \frac{200\text{km}}{50\text{ km/hr}} = 7.2\text{ hr}$$

so speed ~ $\frac{400\text{km}}{7.2\text{hr}} \sim 55\text{ km/hr}$

Ave velocity = 0 because displacement = 0

23) $V^2 = V_0^2 + 2a\Delta x$ $\quad \frac{100\text{km}}{\text{hr}}\left(\frac{1000\text{m}}{1\text{km}}\right)\left(\frac{1\text{hr}}{3600\text{s}}\right) = 27.8\text{ m/s}$

$0^2 = (27.8\text{ m/s})^2 + 2a(55\text{m})$

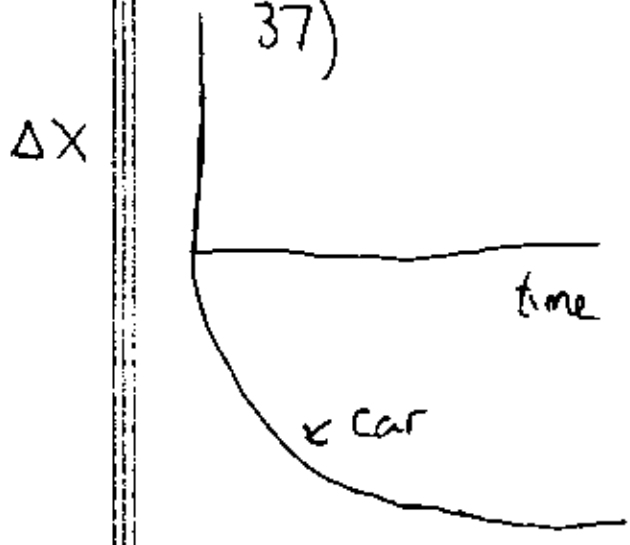
$a = -7.0\text{ m/s}^2 \sim .71g$

31) $V^2 = V_0^2 + 2a\Delta x$

$(32\text{m/s})^2 = (0\text{m/s})^2 + 2(3\text{m/s}^2)\Delta x$

$\Delta x = \frac{(32\text{m/s})^2}{2(3\text{m/s}^2)} = 171\text{m}$

37)



$$\Delta X = \left(55\ km/hr\right)t - \tfrac{1}{2}\left(.5\ m/s^2\right)t^2$$

Quadratic

$$0 = V = \frac{55\ km}{hr} - \left(.5\ m/s^2\right)t$$

$$\frac{55\ km}{hr} = 15.3\ m/s$$

$$0 = 15.3\ m/s - .5\ m/s^2\ t$$

(10) ~~30.6~~ 30.6 s

a) $\Delta X = (15.3\ m/s)(30.6\ s) - \tfrac{1}{2}(.5\ m/s^2)(30.6\ s)^2$

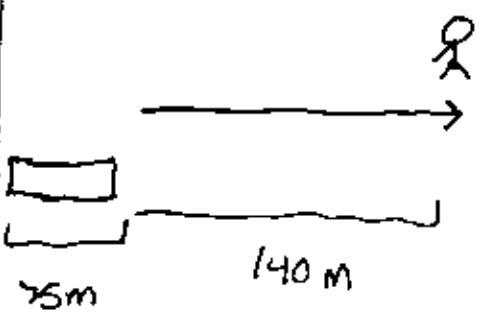
$= 234\ m$

c) 1st ~~second~~ second.

$\Delta X(t=0)$	$\Delta X(t=1)$	$(t=4)$	$(t=5)$
0	54.75 m	216 m	268.75

during first sec: 54.75 m
fifth second: 52.75 m (268.75 m − 216 m)

41)



front of train

$V^2 = 2a(140\,m)$

$\frac{(25\,m/s)^2}{2(140\,m)} = a = 2.23\,m/s^2$

(same for back of train)

back of train

$V^2 = 2(2.23\,m/s^2)(215\,m)$ $\quad V \sim 31\,m/s$

51)

$\Delta y = 0$ for full journey $\quad \Delta y = 2.55\,m$ for half

$V = 0$ at top

$0^2 = V_0^2 - 2(9.81\,m/s^2)(2.55\,m)$

$V_0 \doteq 7.07\,m/s$ $\quad V = 0 = V_0 - gt$

so $t = (7.07\,m/s)(9.81\,m/s^2)$

$= .721\,s$ (half the journey)

$= 1.44\,s$ (full journey)

58) $V^2 = (23\,m/s)^2 - 2(9.81\,m/s^2)\Delta y$

Δy: ↑ 12 m

$V = \pm 17.1\ m/s$

b) could use quadratic but

↑ +17.1 m/s

$(17.1\,m/s) = 23\,m/s - (9.81\,m/s^2)\,t$

$t = .60\,s$ or

+↓ $(-17.1\,m/s) = 23\,m/s - (9.81\,m/s)\,t$

$t = 4.09\,s$

c) going up and down

63) ① ↓ ② ↑

$\Delta y = V_s t_2 = V_s(3.4s - t_1)$

$t_1 + t_2 = 3.4s$

+ $\Delta y = +\frac{1}{2} g t_1^2$

set Δy equal (up ⇒ down)

$V_s(3.4s - t_1) = \frac{1}{2} g t_1^2$

$\frac{1}{2} g t_1^2 + 340\,m/s\,t_1 - 1156\,m = 0$

$t_1 = \dfrac{-340\,m/s \pm \sqrt{(1.383\times10^5)\,m^2/s^2}}{9.81\,m/s^2} = 3.25s$

$\Delta y = \frac{1}{2}(9.81\,m/s^2)(3.25s)^2$

$= 51.8\,m$

89) $V = gt$ $+\downarrow$ $(12\,m/s) = (9.81\,m/s^2)\,t$

$t = 1.22\,s$ for second stone $\Delta y = \frac{1}{2}gt^2 = 7.3\,m$

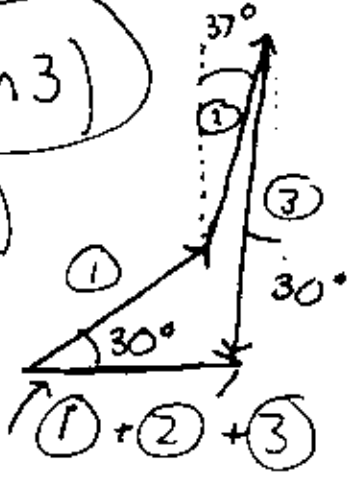
first stone $t = 2.72\,s$

$$\Delta y = \tfrac{1}{2}gt^2 = 36.3\,m$$

so sep by ~ 29 m

ch 3)

5)



15 $\vec{B} - 2\vec{A}$ $\quad B_x - 2A_x =$

$-26.5\cos 56^\circ - 88.0\cos 28^\circ$

$= -62.9$

$B_y - 2A_y$

$+26.5\sin 56^\circ - 88.0\sin 28^\circ$

$= -19.3$

$C1 = \sqrt{(62.9)^2 + (19.3)^2} = 65.8$ $\quad \theta = \tan^{-1}\left(\frac{-19.3}{-62.9}\right)$

$= 17^\circ$ Below x-Axis

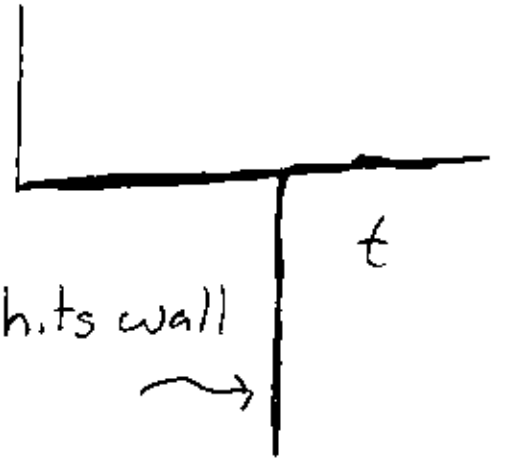
Java 2.2

	Δx	dist	$\overline{Vel}$	$\overline{speed}$
1.5s to 12.0s	0	18m	0	2m/s
1.5s to 6.0s	+9m	9m	+2m/s	2m/s
6.0s to 12.0s	-9m	9m	-2m/s	2m/s

c) NO

d) Yes

e) dist always greater



Java 2.8

yellow - const velocity

purple - $a = -\frac{1}{2}\,m/s \,/\, s = \frac{-1\,m/s^2}{2}$

$\Delta x_y = -5_s t$

$\Delta x_p = -5t - \frac{1}{4}t^2$ → need to make up 3 m

$\Delta x_p = \Delta x_y - 3m$

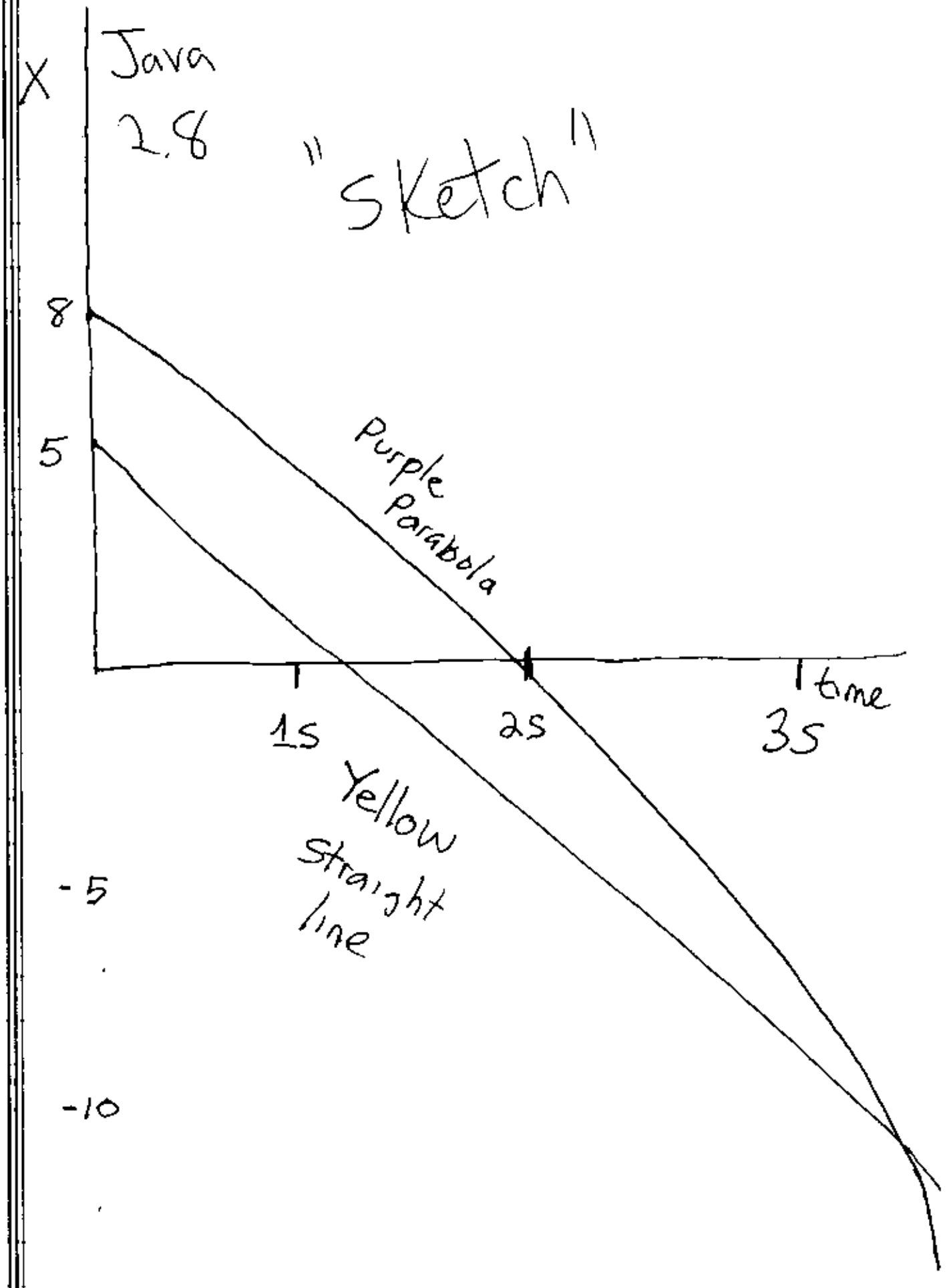
so $-5t = -5t - \frac{1}{4}t^2 + 3$

$t = \sqrt{12} = 2\sqrt{3}\ s$

$\Delta x_y = (-5_s)\,2\sqrt{3}\ s$

$= -10\sqrt{3}\ m$

$\sim -17\ m$


X
Java
2.8
"Sketch"
8
5
Purple
Parabola
Time
1s
2s
3s
Yellow
Straight
line
-5
-10