Calculus 7-1

1. $h = 80 - 15t - 4.9t^2$

$h'(t) = -15 - 9.8t$

$h'(1) = -15 - 9.8(1)$
$= -24.8$ m/s

$h'(2) = -15 - 9.8(2)$
$= -15 - 19.6$
$= -34.6$ m/s

2. $h = 24.5t - 4.9t^2$

$h'(t) = 24.5 - 9.8t$

a) $h'(1) = 24.5 - 9.8(1)$
$= 14.7$ m/s

$h'(2) = 24.5 - 9.8(2)$
$= 24.5 - 19.6$
$= 4.9$ m/s

$h'(3) = 24.5 - 9.8(3)$
$= 24.5 - 29.4$
$= -4.9$ m/s

$h'(4) = 24.5 - 9.8(4)$
$= 24.5 - 39.2$
$= -14.7$ m/s

b) $0 = 24.5 - 9.8t$
$-24.5 = -9.8t$
$2.5 = t$ (sec)

c) $h(2.5) = 24.5(2.5) - 4.9(2.5)^2$
$= 61.25 - 30.625$
$= 30.625$ m

d) $0 = 24.5t - 4.9t^2$
$0 = t(24.5 - 4.9t)$
$t = 0$ or $24.5 - 4.9t = 0$
$-4.9t = -24.5$
$t = 5$
0 or 5 sec.
↑ when it is tossed.

e) $h'(5) = 24.5 - 9.8(5)$
$= 24.5 - 49$
$= -24.5$ m/s

7-1 cont.

3. $s = 160t^2 + 20t$

$s' = 160 \cdot 2t + 20$

$= 320t + 20$

$100 = 320t + 20$

$80 = 320t$

$\frac{1}{4} = t$ (hr)

4. $s = t^3 - 3t^2 - 5t$

$s' = 3t^2 - 6t - 5$

$4 = 3t^2 - 6t - 5$

$0 = 3t^2 - 6t - 9$

$0 = 3(t^2 - 2t - 3)$

$0 = 3(t-3)(t+1)$

$t - 3 = 0$ or $t + 1 = 0$

$t = 3$ sec $\quad t = -1$ not a solution $(t \geq 0)$

5. $s = t^2 - 4t + 4$

$s' = 2t - 4$

a) $s'(1) = 2(1) - 4$

$= 2 - 4$

$= -2$ m/s

$s'(3) = 2(3) - 4$

$= 6 - 4$

$= 2$ m/s

b) $0 = 2t - 4$

$4 = 2t$

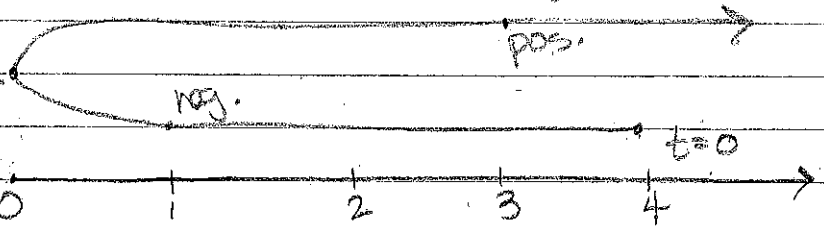
$2 = t$ (sec)

c) 1 2 3

neg. rest pos.

after 2 sec.

d) $t = 2$



$s'(0) = 2 \cdot 0 - 4$

$= -4$

7-1 cont.

6. $s = t^3 - 15t^2 + 63t$

$s' = 3t^2 - 30t + 63$

a) $\frac{0}{3} = \frac{3t^2}{3} - \frac{30t}{3} + \frac{63}{3}$

$0 = t^2 - 10t + 21$

$0 = (t-3)(t-7)$

$t-3=0$ or $t-7=0$

$t = 3$ $\quad t = 7$

b) $s'(0) = 3(0)^2 - 30(0) + 63$

$= 63$

$s'(1) = 3(1)^2 - 30(1) + 63$

$= 36$ pos A

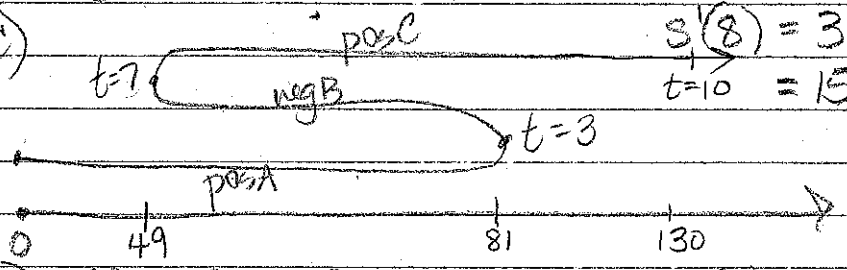
$s'(4) = 3(4)^2 - 30(4) + 63$

$= -9$ neg B

$s'(8) = 3(8)^2 - 30(8) + 63$

$= 15$ pos C

c)



d) $s(3) = 3^3 - 15 \cdot 3^2 + 63 \cdot 3$

$= 27 - 135 + 189$

$= 81$

$s(7) = 7^3 - 15(7)^2 + 63(7)$

$= 343 - 735 + 441$

$= 49$

$s(10) = 10^3 - 15(10)^2 + 63(10)$

$= 1000 - 1500 + 630$

$= 130$

time 0-3 = 81 $\quad = 81$

time 3-7 = 81-49 $\quad = 32$

time 7-10 = 130-49 $\quad = 81$

194 m

7-1 cont.

7. $s = 450 + 10t - 5t^2$

$s' = 10 - 10t$

a) $0 = 10 - 10t$

$10t = 10$

$t = 1$ sec.

b) $\frac{0}{5} = \frac{450}{5} + \frac{10t}{5} - \frac{5t^2}{5}$

$0 = 90 + 2t - t^2$

$t = \frac{-2 \pm \sqrt{2^2 - 4(-1)(90)}}{2(-1)}$

$= \frac{-2 \pm \sqrt{4 + 360}}{-2}$

$= \frac{-2 \pm \sqrt{364}}{-2}$

$= -8.54$ or 10.54 sec

$t \geq 0$

c) $s'(10.54) = 10 - 10(10.54)$

$= 10 - 105.4$

$= -95.4$ m/s