AP Calculus BC — Straight-Line Motion

1) $s(t) = -t^3 + 7t^2 - 14t + 8$

a) $s'(t) = -3t^2 + 14t - 14$

b) $s'(4) = -48 + 56 - 14$
$= -6$ m/sec
At $t=4$ sec, the particle is moving to the left.

c) $ROC_{avg} = \frac{s(12) - s(0)}{12 - 0}$
$= -74$ m/sec

d) $s'(t) = -3t^2 + 14t - 14 = 0$
$3t^2 - 14t + 14 = 0$
$t = \frac{14 \pm \sqrt{196 - 168}}{6}$ sec.

2) $h(t) = 3 + 135t - 16t^2$

$v(t) = 135 - 32t$ $\quad v(3) = 39$ $\quad v(6) = -57$

$a(t) = -32$ $\quad a(3) = -32$ $\quad a(6) = -32$

3) $s(t) = t^2 - 5t - 8$

a) $s(3) = -14$

b) $v(t) = 2t - 5$
$v(3) = 1$

c) $\Delta s = s(7) - s(1)$
$= 6 + 12$
$= 18$

4) $v(2.3) \approx \frac{s(2.5) - s(2.0)}{2.5 - 2.0}$
$= \frac{-4 + 8.5}{0.5} = 9$ ft/sec

5) $s(t) = -4\cos t - \frac{t^2}{2} + 10$

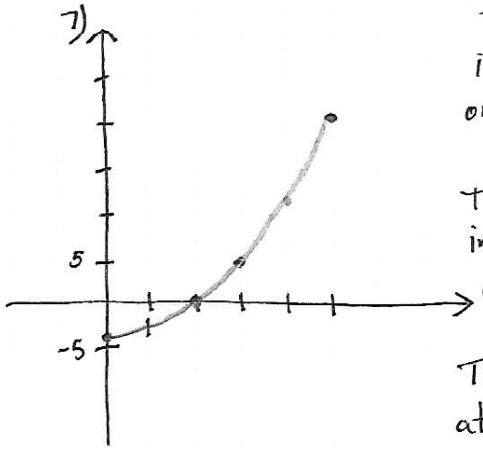
$v(t) = 4\sin t - t$

$a(t) = 4\cos t - 1 = 0$
$t = 1.318 \rightarrow T$
$v(1.318) = 2.554$
(D)

6) $v(t) = 4 - (0.98)^{-t^2}$

$a(4) = -0.223$
(A)

7)



The car is traveling in a negative direction on $(0,2)$ since $v(t) < 0$.

The car is traveling in a positive direction on $(2,5)$ since $v(t) > 0$.

The car changes direction at $t=2$ since $v(t)$ changes signs

8) $v(t) = 2t^3 - 9t^2 + 12t - 5$

$a(t) = 6t^2 - 18t + 12 = 0$
$t = 2 \quad t = 1$

$|v(1)| = 0$ $\quad |v(2)| = 1$