

Calculus 7-2

1. a) $s = 12 + 30t$
 $v = 30$
 $a = 0$

b) $s = 16t^2 + 5t - 10$
 $v = 32t + 5$
 $a = 32$

c) $s = t^3 + 5t^2 + t + 1$
 $v = 3t^2 + 10t + 1$
 $a = 6t + 10$

d) $s = \sqrt{t^2 + t}$
 $= (t^2 + t)^{\frac{1}{2}}$
 $v = \frac{1}{2}(t^2 + t)^{-\frac{1}{2}}(2t + 1)$
 $= \frac{2t + 1}{2\sqrt{t^2 + t}}$

$$a = \frac{1}{2} \left(\frac{-1}{2} \right) (t^2 + t)^{-\frac{3}{2}} (2t + 1)(2t + 1) + \frac{1}{2} (t^2 + t)^{-\frac{1}{2}} (2)$$

$$= \frac{-(2t + 1)^2}{4(t^2 + t)^{\frac{3}{2}}} + \frac{1}{(t^2 + t)^{\frac{1}{2}}} \cdot \frac{4(t^2 + t)}{4(t^2 + t)}$$

$$= \frac{-(4t^2 + 4t + 1) + 4t^2 + 4t}{4(t^2 + t)^{\frac{3}{2}}}$$

$$= \frac{-4t^2 - 4t - 1 + 4t^2 + 4t}{4(t^2 + t)^{\frac{3}{2}}}$$

$$= \frac{-1}{4(t^2 + t)^{\frac{3}{2}}}$$

2. $s = t^3 - 12t$, $t \geq 0$

$v = 3t^2 - 12$
 $a = 6t$

$0 = 3t^2 - 12$
 $12 = 3t^2$
 $4 = t^2$
 $2 = t, t \geq 0$

$a = 6 \cdot 2$
 $= 12 \text{ m/s}^2$

3. $s = t^3 - 9t^2 + 18t$

$v = 3t^2 - 18t + 18$
 $a = 6t - 18$

a) $0 = 6t - 18$
 $18 = 6t$
 $3 = t \text{ (sec)}$

$v(3) = 3(3)^2 - 18(3) + 18$
 $= 27 - 54 + 18$
 $= -9 \text{ m/sec}$

b) $s(3) = 3^3 - 9(3)^2 + 18(3)$
 $= 27 - 81 + 54$
 $= 0 \text{ m}$

7-2 cont.

4. $s = t^4 - 12t^3 + 30t^2 + 5t$, $t \geq 0$

$$v = 4t^3 - 36t^2 + 60t + 5$$

$$a = 12t^2 - 72t + 60$$

$$a(0.5) = 12(0.5)^2 - 72(0.5) + 60$$

$$= 27 \text{ pos.}$$

$$0 = \frac{12t^2}{12} - \frac{72t}{12} + \frac{60}{12}$$

$$a(2) = 12(2)^2 - 72(2) + 60$$

$$= -36 \text{ neg.}$$

$$0 = t^2 - 6t + 5$$

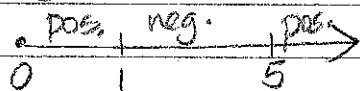
$$0 = (t-5)(t-1)$$

$$t-5=0 \text{ or } t-1=0$$

$$t=5 \quad t=1$$

$$a(6) = 12(6)^2 - 72(6) + 60$$

$$= 60 \text{ pos}$$



positive: $0 \rightarrow 1$ sec, $5 \rightarrow$ sec
negative: $1-5$ sec

5. a) $v(t) = -12t + 20$

$$a(t) = -12 \text{ deceleration}$$

b) $0 = -12t + 20$

$$12t = 20$$

$$t = \frac{20}{12}$$

$$t = \frac{5}{3} \text{ sec}$$