SATPREP

Assignment: *Kinematics*

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$ and the acceleration function $a(t)$.

1) $s(t) = -t^3 + 30t^2 - 225t$

2) $s(t) = -t^3 + 23t^2 - 120t$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the displacement of the particle and the distance traveled by the particle over the given interval.

3) $s(t) = -t^2 + 6t + 27;\ \ 1 \leq t \leq 9$

4) $s(t) = -t^2 + 13t - 12;\ \ 3 \leq t \leq 7$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the particle changes directions, the intervals of time when the particle is moving left and moving right, the times t when the acceleration is 0, and the intervals of time when the particle is slowing down and speeding up.

5) $s(t) = t^3 - 23t^2 + 120t$

6) $s(t) = t^3 - 10t^2$

7) $s(t) = t^3 - 16t^2 + 64t$

8) $s(t) = -t^3 + 30t^2 - 225t$

Answers to Assignment: Kinematics

1) $v(t) = -3t^2 + 60t - 225$, $a(t) = -6t + 60$ 2) $v(t) = -3t^2 + 46t - 120$, $a(t) = -6t + 46$

3) Displacement: -32 4) Displacement: 12

     Distance traveled: 40

                      Distance traveled: $\dfrac{25}{2} = 12.5$

5) Changes direction at: $t = \left\{ \dfrac{10}{3}, 12 \right\}$, Moving left: $\dfrac{10}{3} < t < 12$, Moving right: $0 \le t < \dfrac{10}{3}$, $t > 12$

     Acceleration zero at: $t = \left\{ \dfrac{23}{3} \right\}$, Slowing down: $0 \le t < \dfrac{10}{3}$, $\dfrac{23}{3} < t < 12$, Speeding up: $\dfrac{10}{3} < t < \dfrac{23}{3}$, $t > 12$

6) Changes direction at: $t = \left\{ \dfrac{20}{3} \right\}$, Moving left: $0 < t < \dfrac{20}{3}$, Moving right: $t > \dfrac{20}{3}$

     Acceleration zero at: $t = \left\{ \dfrac{10}{3} \right\}$, Slowing down: $\dfrac{10}{3} < t < \dfrac{20}{3}$, Speeding up: $0 < t < \dfrac{10}{3}$, $t > \dfrac{20}{3}$

7) Changes direction at: $t = \left\{ \dfrac{8}{3}, 8 \right\}$, Moving left: $\dfrac{8}{3} < t < 8$, Moving right: $0 \le t < \dfrac{8}{3}$, $t > 8$

     Acceleration zero at: $t = \left\{ \dfrac{16}{3} \right\}$, Slowing down: $0 \le t < \dfrac{8}{3}$, $\dfrac{16}{3} < t < 8$, Speeding up: $\dfrac{8}{3} < t < \dfrac{16}{3}$, $t > 8$

8) Changes direction at: $t = \{5, 15\}$, Moving left: $0 \le t < 5$, $t > 15$, Moving right: $5 < t < 15$

     Acceleration zero at: $t = \{10\}$, Slowing down: $0 \le t < 5$, $10 < t < 15$, Speeding up: $5 < t < 10$, $t > 15$