AP Calculus Name_____

Position, Velocity, Acceleration Practice

Date_____ Period____

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

1) $s(t) = -t^4 + 15t^3$

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

2) $s(t) = t^4 - 12t^3$

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.

3) $s(t) = t^4 - 8t^3$

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 acceleration is 0.

4) $s(t) = t^2 - 4t - 96$

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

5) $s(t) = -t^2 + t + 72$

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

6) $s(t) = -t^2 + 13t$; at $t = 4$

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 $a(t)$.

7) $s(t) = t^3 - 28t^2 + 196t$

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

8) $s(t) = -t^3 + 10t^2$; at $t = 7$

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 acceleration is 0.

9) $s(t) = -t^3 + 12t^2$

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

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

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

11) $s(t) = -t^4 + 11t^3$; at $t = 4$

Answers to Position, Velocity, Acceleration Practice

1) $v(t) = -4t^3 + 45t^2$ 2) $a(t) = 12t^2 - 72t$ 3) Changes direction at: $t = \{6\}$

4) Acceleration zero: Never 5) Slowing down: $0 \le t < \frac{1}{2}$, Speeding up: $t > \frac{1}{2}$

6) $s(4) = 36$, $v(4) = 5$, speed at 4 = 5, $a(4) = -2$ 7) $v(t) = 3t^2 - 56t + 196$, $a(t) = 6t - 56$

8) $s(7) = 147$, $v(7) = -7$, speed at 7 = 7, $a(7) = -22$ 9) Acceleration zero at: $t = \{4\}$

10) Slowing down: $0 \le t < \frac{10}{3}$, $\frac{23}{3} < t < 12$, Speeding up: $\frac{10}{3} < t < \frac{23}{3}$, $t > 12$

11) $s(4) = 448$, $v(4) = 272$, speed at 4 = 272, $a(4) = 72$