Name_____

Calculus Practice: Rectilinear Motion 2

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

1) $v(t) = -3t^2 + 44t - 105$

2) $v(t) = -2t + 8$

3) $v(t) = -4t^3 + 30t^2$

4) $v(t) = -4t^3 + 24t^2$

5) $v(t) = -2t + 12$

6) $v(t) = -2t + 16$

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

7) $v(t) = -2t + 14$

8) $v(t) = -4t^3 + 24t^2$

9) $v(t) = -2t + 6$

10) $v(t) = 4t^3 - 42t^2$

Name_____

Calculus Practice: Rectilinear Motion 2

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

1) $v(t) = -3t^2 + 44t - 105$

$a(t) = -6t + 44$

Changes direction at: $t = \left\{3, \dfrac{35}{3}\right\}$, Moving down: $0 \leq t < 3$, $t > \dfrac{35}{3}$, Moving up: $3 < t < \dfrac{35}{3}$

Acceleration zero at: $t = \left\{\dfrac{22}{3}\right\}$, Slowing down: $0 \leq t < 3$, $\dfrac{22}{3} < t < \dfrac{35}{3}$, Speeding up: $3 < t < \dfrac{22}{3}$, $t > \dfrac{35}{3}$

2) $v(t) = -2t + 8$

$a(t) = -2$

Changes direction at: $t = \{4\}$, Moving down: $t > 4$, Moving up: $0 \leq t < 4$

Acceleration zero: Never, Slowing down: $0 \leq t < 4$, Speeding up: $t > 4$

3) $v(t) = -4t^3 + 30t^2$

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

Changes direction at: $t = \left\{\dfrac{15}{2}\right\}$, Moving down: $t > \dfrac{15}{2}$, Moving up: $0 < t < \dfrac{15}{2}$

Acceleration zero at: $t = \{0, 5\}$, Slowing down: $5 < t < \dfrac{15}{2}$, Speeding up: $0 < t < 5$, $t > \dfrac{15}{2}$

4) $v(t) = -4t^3 + 24t^2$

$a(t) = -12t^2 + 48t$

Changes direction at: $t = \{6\}$, Moving down: $t > 6$, Moving up: $0 < t < 6$

Acceleration zero at: $t = \{0, 4\}$, Slowing down: $4 < t < 6$, Speeding up: $0 < t < 4$, $t > 6$

5) $v(t) = -2t + 12$

$a(t) = -2$

Changes direction at: $t = \{6\}$, Moving down: $t > 6$, Moving up: $0 \leq t < 6$

Acceleration zero: Never, Slowing down: $0 \leq t < 6$, Speeding up: $t > 6$

6) $v(t) = -2t + 16$

$a(t) = -2$
Changes direction at: $t = \{8\}$, Moving down: $t > 8$, Moving up: $0 \le t < 8$
Acceleration zero: Never, Slowing down: $0 \le t < 8$, Speeding up: $t > 8$

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

7) $v(t) = -2t + 14$

$a(t) = -2$
Changes direction at: $t = \{7\}$, Moving left: $t > 7$, Moving right: $0 \le t < 7$
Acceleration zero: Never, Slowing down: $0 \le t < 7$, Speeding up: $t > 7$

8) $v(t) = -4t^3 + 24t^2$

$a(t) = -12t^2 + 48t$
Changes direction at: $t = \{6\}$, Moving left: $t > 6$, Moving right: $0 < t < 6$
Acceleration zero at: $t = \{0, 4\}$, Slowing down: $4 < t < 6$, Speeding up: $0 < t < 4$, $t > 6$

9) $v(t) = -2t + 6$

$a(t) = -2$
Changes direction at: $t = \{3\}$, Moving left: $t > 3$, Moving right: $0 \le t < 3$
Acceleration zero: Never, Slowing down: $0 \le t < 3$, Speeding up: $t > 3$

10) $v(t) = 4t^3 - 42t^2$

$a(t) = 12t^2 - 84t$
Changes direction at: $t = \left\{\dfrac{21}{2}\right\}$, Moving left: $0 < t < \dfrac{21}{2}$, Moving right: $t > \dfrac{21}{2}$

Acceleration zero at: $t = \{0, 7\}$, Slowing down: $7 < t < \dfrac{21}{2}$, Speeding up: $0 < t < 7$, $t > \dfrac{21}{2}$