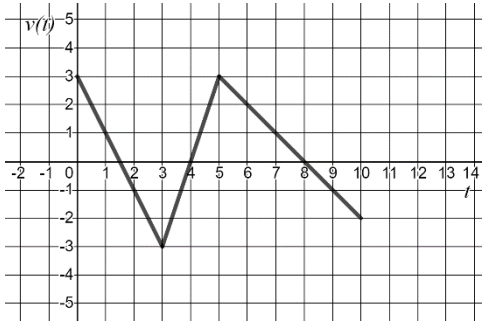
NAME _____ DATE _____ PD _____

**AP CALCULUS** **Chapter 3 Review** **Derivatives**

For questions #1-3, $x(t)$ is measured in meters and $t$ is measure in seconds. Justify each solution.

1) Suppose $x(t) = t^3 - 9t^2 + 15t + 4$ is a position of a particle moving along the x-axis on the interval $[0,10]$.
   a. Find the average velocity for the first 3 seconds.
   b. Find the velocity at $t = 4$.
   c. When is the particle moving to the left? Right?
   d. When is the velocity increasing?
   e. When is the velocity decreasing?
   f. When is the particle speeding up?
   g. When is the particle slowing down?

2) A particle is moving along the x-axis on the interval $[0,10]$.




   a. Find the average acceleration on the interval $[0,10]$.
   b. Find the velocity at $t = 2$.
   c. Find the acceleration at $t = 2$.
   d. At $t = 9$ is the particle speeding up or slowing down?
   e. When is the particle moving to the left? Right?
   f. When is the velocity of the particle increasing?
   g. When is the acceleration of the particle negative?
   h. When is the particle speeding up?
   i. When is the particle slowing down?

3) Given below is the position, velocity, and acceleration of a particle moving along the x-axis.

| $t$ | 0 | 2 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| $x(t)$ | 5 | $-2$ | $-3$ | $-3$ | 12 |
| $v(t)$ | 1 | 5 | 3 | 3 | 8 |
| $a(t)$ | $-3$ | $-3$ | 6 | $-3$ | $-6$ |

   a. Find the average velocity at between $t = 0$ and $t = 8$.
   b. Find the average acceleration at between $t = 0$ and $t = 8$.
   c. Find $\frac{x(6)-x(4)}{6-4}$. Using correct units explain what it means in the context of this problem.
   d. At $t = 2$ is the particle moving left or right?
   e. At $t = 2$ is the velocity decreasing or increasing?
   f. At $t = 2$ is the particle speeding up or slowing down?
   g. Does the particle change directions at least once $t = 0$ and $t = 4$?

4) Use the table to find $h'(3)$ for each. (Don't forget the product and quotient rules!)

| $x$ | $f(x)$ | $f'(x)$ | $g(x)$ | $g'(x)$ |
|---|---|---|---|---|
| 3 | 5 | -3 | 2 | 4 |

   a. $h(x) = 2f(x) + 3g(x)$
   b. $h(x) = f(x)g(x)$
   c. $h(x) = \frac{f(x)}{x^2}$
   d. $h(x) = \frac{g(x)}{f(x)}$