

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Pd: \_\_\_\_\_

## AP Calculus AB

### Quiz: Particle Motion

The position of a particle moving along the  $x$ -axis is given by the function  $x(t) = 2t \ln(4.5 - t)$  for  $0 \leq t \leq 4$ , where  $t$  is measured in minutes and  $x(t)$  is measured in feet.

1. Find the initial position of the particle. Include units.
2. Write an equation representing the velocity of the particle at time  $t$ .
3. Find the initial velocity of the particle. Include units.
4. Write an equation representing the acceleration of the particle at time  $t$ .
5. Find the initial acceleration of the particle. Include units.
6. Find the acceleration of the particle when the velocity is 0. Include units.
7. At what time(s)  $t$  is the particle at the origin?
8. At what time(s)  $t$  is the particle at rest?
9. At what time(s)  $t$  does the particle change direction?
10. Find the intervals on which the particle is moving right.
11. Find the intervals on which the particle is moving left.
12. Find the net distance traveled from  $t = 0$  to  $t = 4$ . Include units.
13. Find the total distance traveled from  $t = 0$  to  $t = 4$ . Include units.
14. Find the intervals on which the velocity is increasing.
15. Find the intervals on which the velocity is decreasing.
16. Find the intervals on which the particle is speeding up.
17. Find the intervals on which the particle is slowing down.
18. Find the average velocity of the particle between  $t = 1$  and  $t = 3$  minutes. Include units.
19. Find the average acceleration of the particle between  $t = 1$  and  $t = 3$  minutes. Include units.
20. At what time  $t$  is the particle farthest to the right?
21. At what time  $t$  is the particle farthest to the left?
22. Find the maximum velocity of the particle between  $t = 0$  and  $t = 4$ . Include units.