

AP2013 ab2:

A particle moves along a straight line. For $0 \leq t \leq 5$, the velocity of the particle is given by $v(t) = -2 + (t^2 + 3t) - t^3$, and the position of the particle is given by $s(t)$. It is known that $s(0) = 10$.

- (a) Find all values of t in the interval $2 \leq t \leq 4$ for which the speed of the particle is 2.
 - (b) Write an expression involving an integral that gives the position $s(t)$. Use this expression to find the position of the particle at time $t = 5$.
 - (c) Find all times t in the interval $0 \leq t \leq 5$ at which the particle changes direction. Justify your answer.
 - (d) Is the speed of the particle increasing or decreasing at time $t = 4$? Give a reason for your answer.
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