AP Calculus AB — Mock Salad 0508

Dr. Paul L. Bailey — Friday, May 8, 2020

Problem 1. A particle moves along the x-axis. The velocity of the particle is modeled by a strictly decreasing, twice differentiable function $v(t)$ measured in meters per second. Select values of $v(t)$ at specific times t, measured in seconds, are given below. It is known at time $t = 7$, the particle's position is 3 units to the right of the origin.

t (sec)	2	3	5	7	9
$v(t)$ (m/sec)	3	1	0	-6	-8

(a) Estimate $v'(2.5)$ and $v'(6)$. Interpret the meanings in context including units.

(b) State whether the particle is speeding up or slowing down at both $t = 2.5$ and $t = 6$.

(c) The particle's position is modeled by the function $P(t)$. Write an equation of the tangent line to the graph of P at $t = 7$. use the tangent line to approximate $P(8)$.

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(d) Is the estimate in part **(c)** an under approximation or over approximation of $P(8)$? Explain how you know.

(e) Claire, a calculus student, uses a left Riemann sum of three subintervals to approximate $\int_2^7 v(t)\,dt$. Is her approximation an overestimate or underestimate of the actual value? Explain how you know.

(f) Another particle Q is also moving along the x-axis. Let $Q(x) = 4 + 5x - x^2$. State open interval(s) during $2 \leq t \leq 9$ when particle P and particle Q are moving in the same direction.