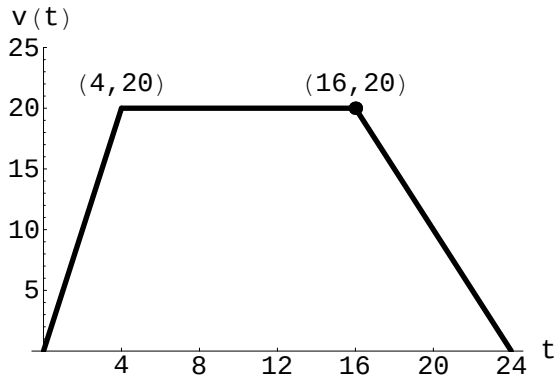
AP CALCULUS
2005AB5 NAME: PERIOD:
9 POINTS (2,3,2,2)

You MAY NOT use your calculators.



A car is traveling on a straight road. For $0 \le t \le 24$ seconds, the car's velocity $v(t)$, in meters per second, is modeled by the piecewise-linear function defined by the graph above.

(a) Find $\int_0^{24} v(t)\,\mathrm{d}t$. Using correct units, explain the meaning of $\int_0^{24} v(t)\,\mathrm{d}t$.

(b) For each of $v'(4)$ and $v'(20)$, find the value or explain why it does not exist. Indicate units of measure.

(c) Let $a(t)$ be the car's acceleration at time t, in meters per second per second. For $0 < t < 24$, write a piecewise-defined function for $a(t)$.

(d) Find the average rate of change of v over the interval $8 \leq t \leq 20$. Does the Mean Value Theorem guarantee a value of c, for $8 < t < 20$, such that $v'(c)$ is equal to this average rate of change? Why or why not?