Mock Exam:
March 27th - 7:30 am
Room 5

March 24

How do you find the average value of a function?

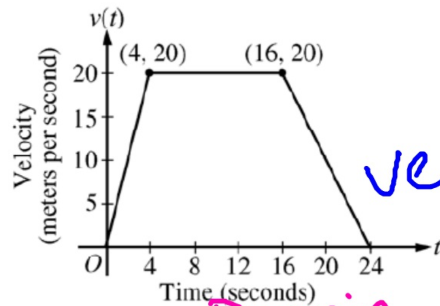
How do you find the average rate of change?

March 24

Students will verbally explain how to find the average value and the average rate of change of a function

(using the words:
integral, interval...)

$a(t) = \begin{cases} \_\_\_ \\ \_\_\_ \\ \_\_\_ \end{cases}$



velocity

MVT

$\frac{f(b)-f(a)}{b-a} = f'($

$a<$

Domain

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

→ Area

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

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

Derivative → Slope

(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 $a(t)$. slopes

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

$\text{slope} = \frac{f(b)-f(a)}{b-a}$ $a=8$ $b=20$

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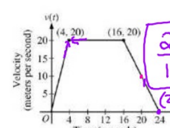
Question 5

A car is traveling on a straight road. For $0 \le t \le 24$ seconds, the car's velocity $v(t)$, in m... function defined b...



$\frac{20-0}{16-24}$

$\frac{20}{-8} = \frac{5}{-2}$

(a) Find $\int_0^{24} v(t)$ ...

(b) For each of v'... exist. Indicate ...

$y - 0 = -\frac{5}{2}(x-24)$

$y = -\frac{5}{2}(20-24)$

$= -\frac{5}{2}\left(\frac{-4}{1}\right) = \frac{20}{2} = 10$

(c) Let $a(t)$ be th... ...l. For $0 < t < 24$, write a piecewise-defi...

(d) Find the avera... ...Mean Value Theorem guarantee a value of c, f... ...change? Why or why not?

(a) $\int_0^{24} v(t)\,dt = \frac{1}{2}(4)(20) + (12)(20) + \frac{1}{2}(8)(20) = 360$ The car travels 360 meters in these 24 seconds.	2 : { 1 : value 1 : meaning with units
(b) $v'(4)$ does not exist because $\lim_{t \to 4^-}\left(\frac{v(t)-v(4)}{t-4}\right) = 5 \ne 0 = \lim_{t \to 4^+}\left(\frac{v(t)-v(4)}{t-4}\right)$. $v'(20) = \frac{20-0}{16-24} = -\frac{5}{2}$ m/sec^2	3 : { 1 : $v'(4)$ does not exist, with explanation 1 : $v'(20)$ 1 : units
(c) $a(t) = \begin{cases} 5 & \text{if } 0 < t < 4 \\ 0 & \text{if } 4 < t < 16 \\ -\frac{5}{2} & \text{if } 16 < t < 24 \end{cases}$ $a(t)$ does not exist at $t = 4$ and $t = 16$. $\frac{10-20}{20-8} = \frac{-10}{16}$	2 : { 1 : finds the values 5, 0, $-\frac{5}{2}$ 1 : identifies constants with correct intervals
(d) The average rate of change of v on [8, 20] is $\frac{v(20)-v(8)}{20-8} = -\frac{5}{6}$ m/sec^2. No, the Mean Value Theorem does not apply to v on [8, 20] because v is not differentiable at $t = 16$.	2 : { 1 : average rate of change of v on [8, 20] 1 : answer with explanation