AP Calculus – Across and Down

Clue Set: #9

Topic: Motion w/derivatives, Mean-Value Theorem

Only digits (0 – 9) and negative signs are allowed. If an answer is an integer, use leading zeros to make the answer fit. (Ex: If 4 digits are required and your answer is 46,enter 0046.) If an answer has decimal places, the decimal point is dropped and trailing zeros are used to make the answer fit to the required number of decimal places which is specified in the problem. (Ex: If 2 decimal places are required and your answer is 12.4682, round to 12.47 and enter 1247. If one decimal place is required and your answer is 15, write 15.0 and enter 150. If one decimal place is required and your answer is 0.5, wrote 05.)

Across

A47.   Determine how many times Rolles Theorem is satisfied for the function $f(x) = e^{\sin(\pi x)\cos(\pi x)}$ on the interval [0, 50].

Down

D9. A model rocket has two stages. When it is launched, it travels upwards until it has no upward acceleration. At that time, the second stage ignites. How high is the rocket when the 2nd stage ignites (2 decimal places) if the rocket's height is described by $y(t) = t^3 - 15t^2 + 75t + 5.2$?

D26. Suppose $f(x)$ is differentiable everywhere and $f(-4) = 3$ and $f'(x) \le 4$ for all values of x. Using the Mean-Value Theorem, what is the largest possible value of $f(7)$?

D28. The graph to the right shows the velocity $v(t)$ of a particle over a 100-second period of time. For how many seconds was the particle speeding up?
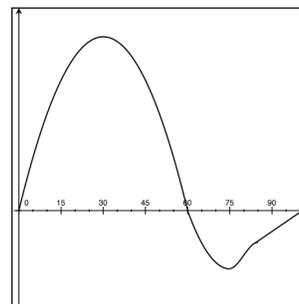
D34. A particle subjected to huge forces is at the positions and has the velocities at $t = 1.5$ and $t = 2$ as shown in the table to the right. Find its average speed over that time interval. (2 decimal places).

t	$x(t)$	$v(t)$
1.5	14.82	41.27
2.0	−61.40	−32.35

D65. The function $f(x) = \sqrt{x} + 10$ passes through the points (1,11) and (a,b). If the value of c satisfying the Mean-Value Theorem for f on the interval $[1,a]$ occurs at $c = 4$, find the values of a and b that fit this situation. Write the answer as a, then b.