AP Calculus – Across and Down

Clue Set: #23

Topic: Integral applications

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

None

Down

D30. **(Gr. Calc.)** A pool with 8,000 gallons of water is being drained. The number of gallons that drains in time t is given by $\int_0^t D(x)dx$ where $D(x) = 85\sin(0.001x^2 + 0.003x + 0.046)$. It is raining as well so the amount

of water that is being added to the pool is given by $\int_0^t A(x)dx$ where $A(x) = e^{0.001x}$. Both

$D(t)$ and $A(t)$ are measured in gallons per minute and t is measured in minutes. What is the rate of change of water in the pool at $t = 20$ in gallons per minute (2 decimal places)?

D36. In an apartment building, all apartments are having smoke detectors installed during a week, starting on Monday. The rate at which apartments have the detectors installed is given by $r(t)$, as shown in the figure to the right. If all smoke detectors in the building have been installed at the end of the 5-day week and 15 were installed previously, what percentage of the detectors has been installed by the end of Monday (1 decimal place)?
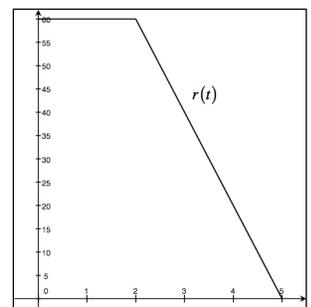
D52. A cruise ship is entering the United States and all its passengers and crew must go through customs. Everyone on the ship must get off and go through customs. When everyone is off the ship and processed, (except for 250 vital crew members), they are allowed to return. The rate that they board the ship is given in the graph to the right as the crew enters through different gangways than the passengers. $C(t)$ is the rate that the crew enters and $P(t)$, made up of 3 lines, is the rate that the passengers enter, both measured in people/hour. The process takes 2 hours. How many people (passengers and crew) are on the ship when it departs?