

AP Calculus – Across and Down

Clue Set: #24

Topic: Growth Problems

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, write 05.)



Across

A66. **(Sci. Calc.)** Steve's AP calculus class completes the curriculum and immediately starts to review for the AP exam. At the start of that process (time $t = 0$), Steve takes a practice AP exam with a maximum score of 108 points and scores a 57. He then starts to study a great deal. One week later ($t = 1$), he takes a second practice exam and his score has increased to 69.75. If his score is projected to increase at a rate proportional to the difference between the maximum score and his current score, find his projected score when he takes the actual AP Calculus exam, 1.25 weeks later (3 decimal places).

Down

D12. **(Sci. Calc.)** A cup of coffee is taken from the microwave when it is boiling (100°C). One minute later, its temperature is (90°C). The change in the temperature is proportional to the difference in its current temperature and the outside air (20°C). The coffee is safe to sip when it is (70°C). How many minutes and seconds (MMSS) are necessary to wait before sipping the coffee?

D57. **(Sci. Calc.)** A town with an initial population of 10,000 is next to a canal. A company started to dump toxic waste into the canal causing odors and it was perhaps detrimental to people's health. People started to move away. 52 years and 4 months later, a statistician did a study and found that the rate of change of the town's population was described by the differential equation $\frac{dP}{dt} = 0.025P - 300$, where t is measured in years from when its initial population was measured. What was the town's population to the nearest person at this time?