

AP Test Question
2005
Part A - With Calculator

| | | | | | |
|--|-----|----|----|----|----|
| Distance x (cm) | 0 | 1 | 5 | 6 | 8 |
| Temperature $T(x)$ ($^{\circ}\text{C}$) | 100 | 93 | 70 | 62 | 55 |

3) A metal wire of length 8 centimeters (cm) is heated at one end. The table above gives selected values of the temperature $T(x)$, in degrees Celsius ($^{\circ}\text{C}$), of the wire from the heated end. The function T is decreasing and twice differentiable.

a) Estimate $T'(7)$. Show the work that leads to your answer. Indicate units of measure.

b) Write an integral expression in terms of $T(x)$ for the average temperature of the wire. Estimate the average temperature of the wire using a trapezoidal sum with the four subintervals indicated by the data in the table. Indicate units of measure.

c) Find $\int_0^8 T'(x) dx$, and indicate units of measure. Explain the meaning of $\int_0^8 T'(x) dx$ in terms of the temperature of the wire.

d) Are the data in the table consistent with the assertion that $T''(x) > 0$ for every x in the interval $0 < x < 8$? Explain your answer.