AP CALCULUS
2005AB3 NAME: PERIOD:
9 POINTS (1,3,2,2,1 for units in (a), (b), and (c))

*You MAY use your calculators.*

| Distance $x$ (cm) | 0 | 1 | 5 | 6 | 8 |
|---|---|---|---|---|---|
| Temp $T(x)$ (Celsius) | 100 | 93 | 70 | 62 | 55 |

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, of the wire $x$ cm 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 $\int_0^8 T'(x)\ \mathrm{d}x$, and indicate units of measure. Explain the meaning of $\int_0^8 T'(x)\ \mathrm{d}x$ in terms of the temperature of the wire.

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(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.