4. [14 points] One of the ways Captain Christina likes to relax in her retirement is to go for long walks around her neighborhood. She has noticed that early every Tuesday morning, a truck delivers butter to a local bakery famous for its cookie dough. Consider the following functions:

- Let $C(b)$ be the bakery’s cost, in dollars, to buy $b$ pounds of butter.
- Let $K(b)$ be the amount of cookie dough, in cups, the bakery makes from $b$ pounds of butter.
- Let $u(t)$ be the instantaneous rate, in pounds per hour, at which butter is being unloaded $t$ hours after 4 am.

Assume that $C$, $K$, and $u$ are invertible and differentiable.

a. [2 points] Interpret $K(C^{-1}(10)) = 20$ in the context of this problem. Use a complete sentence and include units.

b. [3 points] Interpret $\int_5^{12} K'(b) \, db = 40$ in the context of this problem. Use a complete sentence and include units.

c. [3 points] Give a single mathematical equality involving the derivative of $C$ which supports the following claim:
   It costs the bakery approximately $0.70 less to buy 14.8 pounds of butter than to buy 15 pounds of butter.

   Answer: __________________________________________________________________________

d. [3 points] Give a single mathematical equality which expresses the following claim:
   The number of pounds of butter unloaded between 5 and 8 am is twice as many as the bakery needs to make 5000 cups of cookie dough.

   Answer: __________________________________________________________________________

e. [3 points] Assume that $u(t) > 0$ and $u'(t) < 0$ for $0 \leq t \leq 4$ and that $u(2) = 800$.
   Rank the following quantities in order from least to greatest by filling in the blanks below with the options I-IV.

   $I. \quad 0 \quad II. \quad 800 \quad III. \quad \int_1^2 u(t) \, dt \quad IV. \quad \int_2^3 u(t) \, dt$

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