

2. [14 points] Let $C(t)$ be the temperature, in degrees Fahrenheit, of a warm can of soda t minutes after it was put in a refrigerator. Suppose $C(10) = 62$.

- a. [3 points] Assuming C is invertible, give a practical interpretation of the statement $C^{-1}(45) = 40$.

Solution: It was 40 minutes after the soda was put into the refrigerator when the temperature of the soda was 45 degrees Fahrenheit. (Or the temperature of the soda was 45 degrees Fahrenheit after 40 minutes in the refrigerator.)

- b. [3 points] Give a practical interpretation of the statement $C'(10) = -0.4$.

Solution: After 10 minutes in the refrigerator, the temperature of the soda would decrease by about 0.4 degrees Fahrenheit during the next minute.

- c. [3 points] Give a practical interpretation of the statement $\int_0^{10} C'(t) dt = -5$.

Solution: The temperature of the can of soda decreased by 5 degrees Fahrenheit during the first 10 minutes it was in the refrigerator.

- d. [2 points] Assuming the statements in parts (a)-(c) are true, determine $C(0)$.

Solution: By the Fundamental Theorem of Calculus, we have

$$C(0) = C(10) - \int_0^{10} C'(t) dt = 62 - (-5) = 67.$$

So $C(0) = 67$ degrees Fahrenheit.

- e. [3 points] What is the practical meaning of $\int_0^1 C(t) dt$?

Solution: $\int_0^1 C(t) dt$ is the average temperature, in degrees Fahrenheit, of the can of soda during the first minute it is in the refrigerator.