3. [7 points] Iggy the young inchworm starts crawling along a tree branch and eating leaves on the tree so that he can prepare to turn into a moth.

- Let $C(t)$ be the distance Iggy has crawled, in inches, after t minutes.
- Let $E(t)$ be the amount of leaves Iggy has eaten, in milligrams (mg), after t minutes of crawling.

The functions $C(t)$ and $E(t)$ are both invertible and differentiable.

a. [4 points] Find a mathematical equation for each of the statements below using the functions C, E, their inverses, and/or their derivatives.

  i. Iggy has eaten 5 mg of leaves after crawling for 2 minutes.

Answer: $P^{-1}(5) = 2$ **or** $P(2) = 5$

  ii. After crawling 10 inches, Iggy has eaten three times the amount of leaves as he had after crawling 6 inches.

Answer: $E\left(C^{-1}(10)\right) = 3E\left(C^{-1}(6)\right)$

  iii. At 3 minutes of crawling, Iggy's instantaneous velocity is 14 inches per minute.

Answer: $C'(3) = 14$

b. [3 points] Complete the following sentence to give a practical interpretation of the equation

$$E'(3) = 4.$$

If Iggy eats leaves while crawling for 2 minutes and 30 seconds rather than for 3 minutes, then...

Solution: Iggy would eat about 2 mg less of leaves.