

4. [11 points] A city is replacing carbon-based energy production with solar power, saving large amounts of carbon that would otherwise have been burned in energy production. As a consultant for the city, you have created the following functions, which are both differentiable and invertible, to model these quantities.

- $E(t)$  is the solar capacity, in megawatts (MW), of the city  $t$  years after January 1, 2000.
- $C(s)$  is the amount of carbon, in tons, the city would save each day with a solar capacity of  $s$  MW.

- a. [2 points] Using a complete sentence, give a practical interpretation of the equation

$$C^{-1}(15) = 3.$$

- b. [3 points] Write a single equation involving  $E$ ,  $C$ , and/or their inverses that represents the following statement.

*At the start of 2008, the city saved twice as much carbon each day as it did at the start of 2001.*

**Answer:** \_\_\_\_\_

- c. [3 points] Write a single equation involving exactly one of the derivative functions  $E'$ ,  $C'$ ,  $(E^{-1})'$  or  $(C^{-1})'$  that represents the following statement.

*If the city increased its solar capacity from 4.8 to 4.9 MW, it would save about 0.6 additional tons of carbon each day.*

**Answer:** \_\_\_\_\_

- d. [3 points] Using the fact that

$$(E^{-1})'(8) = \frac{2}{3},$$

answer the following question from the city, making sure you **include units** in your answer.

*If we have a solar capacity of 8 MW at the start of 2025, approximately how much time do you expect it to take to increase our solar capacity an additional 0.5 MW?*

**Answer:** \_\_\_\_\_