8. [12 points] The size of the harvest at a kale farm is a function of the total amount of compost the farm uses in the fields.

- Let $K(c)$ be the size (as measured by weight) of the farm’s kale harvest, in tons, when the farm uses $c$ cubic meters ($m^3$) of compost.
- Let $P(h)$ be the farm’s profit, in thousands of dollars, when their kale harvest is $h$ tons.

The functions $K(c)$ and $P(h)$ are differentiable, and the function $P(h)$ is invertible.

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

$$P^{-1}(86) = 53.$$ 

b. [3 points] Write a single equation involving $K, P,$ and/or $P^{-1}$ that represents the following statement.

*If the farm uses 1125 m$^3$ of compost, their profit will be twice as large as if they had used 700 m$^3$ of compost.*

**Answer:**

$$\text{If the farm uses 1125 m}^3 \text{ of compost, their profit will be twice as large as if they had used 700 m}^3 \text{ of compost.}$$

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

$$K'(950) = 0.2.$$ 

*If the farm uses 955 m$^3$ of compost instead of 950 m$^3$, ...* 

**Answer:**

$$\text{If the farm uses 955 m}^3 \text{ of compost instead of 950 m}^3, \ldots$$

d. [4 points] Write a single equation involving the derivative function(s) $K', P',$ and/or $(P^{-1})'$ that represents the following statement.

*In order for the farm’s profit to be $101,500 rather than $100,000, their kale harvest must be about 0.9 tons larger.*

**Answer:**

$$\text{In order for the farm’s profit to be$101,500 rather than$100,000, their kale harvest must be about 0.9 tons larger.}$$