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

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

Solution: In order for the kale farm to make 86 thousand dollars in profit, they need to harvest 53 tons of kale.

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: $P(K(1125)) = 2P(K(700))$

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, ...

Solution: ... they would harvest roughly 1 additional ton of kale.

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: $(P^{-1})'(100) = 0.6$