

5. [10 points] Let us consider the following functions, which concern the productivity of a soybean farm. Bushels are a unit of volume often used to measure a farm's yield.
- Let $Y(b)$ be the yield, in bushels of soybeans, of the farm in the year 2019 when it is infested with b beetles.
 - Let $R(s)$ be the revenue, in dollars, of the farm in the year 2019 when it yields s bushels of soybeans.

The functions $Y(b)$ and $R(s)$ are differentiable and invertible.

- a. [2 points] Use a complete sentence to give a practical interpretation of the equation

$$R(Y(1,200)) = 75,000.$$

- b. [4 points] Write a single equation representing the following statement in terms of the functions Y , R , and/or their inverses:

If there are 1,600 beetles, then the farm yields 200 bushels of soybeans fewer than are necessary for a revenue of \$64,000 in the year 2019.

- c. [4 points] Complete the following sentence to give a practical interpretation of the equation

$$Y'(1,000) = -0.1.$$

If the beetle population was 1,000 rather than 950...

6. [9 points] A metal bar is unevenly heated, and a laser thermometer is used to measure its temperature at various points. Let $T(q)$ be the temperature of the bar, in degrees Celsius, q feet from its leftmost end. Some values of $T(q)$ are shown in the table below.

q	1	2	3	4	5	6	7	8	9
$T(q)$	40	70	90	80	60	90	130	100	60

- a. [3 points] For which of the following intervals of q -values might the function $T'(q)$ be positive for the entire interval? Give your answer as a list of one or more intervals, or write NONE.
- (1, 3) (4, 6) (5, 7) (7, 9)
- b. [3 points] For which of the following intervals of x -values might the function $T(q)$ be concave up for the entire interval? Give your answer as a list of one or more intervals, or write NONE.
- (1, 3) (4, 6) (5, 7) (7, 9)
- c. [3 points] What is the average rate of change of $T(q)$ on the interval $2 \leq q \leq 7$? Include units in your answer.