2. [14 points] Suppose p represents the price of a reuben sandwich at a certain restaurant on State St. $R(p)$ represents the number of reubens the restaurant will sell in a day if they charge $\$p$ per reuben.

a. [3 points] What does $R(5.5)$ represent in the context of this situation?

Solution: $R(5.5)$ is the number of reubens the restaurant will sell in a day if they charge 5.50 dollars per reuben.

b. [3 points] Assuming R is invertible, what does $R^{-1}(305)$ represent?

Solution: $R^{-1}(305)$ is the price (in dollars) per reuben when 305 are sold in a day.

c. [3 points] The owner of the restaurant also has a Church St location. It doesn't get quite as much business, and the owner finds that the State St store sells 35% more reubens than the Church St store sells at the same price. Let $C(p)$ be the number of reubens the Church St location sells in a day at a price of $\$p$ each. Write a formula for $C(p)$ in terms of $R(p)$.

Solution: $R(p) = 1.35C(p)$, so $C(p) = \frac{R(p)}{1.35}$.

d. [5 points] The owner starts doing research on reuben sales at the State St location; he wants to know how the number of reubens sold is related to the price. He finds that every time he raises the price by \$1 per reuben, the number sold in a day decreases by 20%. Let the constant B represent the number of reubens sold in a day at the State St store if the the price of reubens is \$5 each. Write a formula for $R(p)$ involving the constant B. Assume the domain of R is $1 \le p \le 25$.

Solution: The growth factor is $1 - 0.2 = 0.8$, so $R(p) = R_0(0.8)^p$ and $R(5) = B = R_0(0.8)^5$.
So $R_0 = \dfrac{B}{(0.8)^5}$, and we get $R(p) = \dfrac{B}{(0.8)^5}(0.8)^p = B(0.8)^{p-5}$.