12. (12 pts) Suppose that a company (called All Things Food) has hired you as a consultant. You are to help them save their failing product, "Big J's Bar-B-Q Ice Cream." You have discovered that their cost and revenue functions (in dollars) are:

\[ C(q) = 100 + 2q \quad \text{and} \quad R(q) = 15q^{75}, \]

where \( q \) is the number of ice cream containers produced.

a) (1 pt) What is the product's fixed cost?

\[ \text{Fixed cost} = 100 \quad (\text{dollars}). \]

b) (3 pts) Last year, All Things Food produced 2400 containers of Big J's Bar-B-Q Ice Cream. What was their profit?

\[ \text{Profit} = R(2400) - C(2400) = 15 \cdot (2400^{34/75}) - 4900 \]

c) (5 pts) Find formulas for marginal cost and marginal revenue, and evaluate at \( q = 2400 \).

\[ MC(q) = \left(100 + 2q\right)' = 2 \]

\[ MC(2400) = 2 \]

\[ MR(q) = \left(15 \cdot q^{75}\right)' = 15 \cdot (0.75) \cdot q^{-2/4} \]

\[ MR(2400) = \frac{4.5}{4(2400)^{1/4}} \approx 1.61 \]

d) (3 pts) Big J wants to increase production to do better this year. Based on the marginal revenue and marginal cost \textit{at this point} \((q = 2400)\), explain whether Big J's strategy is sound.

\[ \text{Since} \quad MR(2400) - MC(2400) = \frac{45}{4(2400)^{1/4}} - 2 \approx -0.39 < 0; \]

\[ \text{it does \textit{not} make sense to increase production.} \]