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:

$$\mathbf{C(q) = 100 + 2q} \qquad \text{and} \qquad \mathbf{R(q) = 15q^{.75}},$$

where q is the number of ice cream containers produced.

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

Fixed cost = 100 (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?

$$\text{Profit} = R(2400) - C(2400) = 15(2400)^{3/4} - 4900$$

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

$MC(q) =$ $(100 + 2q)' = 2$

$MC(2400) =$ 2

$MR(q) =$ $(15q^{.75})' = 15 \cdot (.75)\, q^{-1/4}$

$MR(2400) =$ $\dfrac{45}{4(2400)^{1/4}} \approx 1.61$

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

Since $MR(2400) - MC(2400)$

$= \dfrac{45}{4(2400)^{1/4}} - 2 \approx -0.39 < 0;$

~~since~~ it does <u>not</u> make sense to increase production.