Economics 100: Quiz #5

You are given the following information:

\[ C(q_s) = 1500 + q_s^4 + 3q_s \]

\[ q_d = \frac{250}{p} - 2 \]

1. Explain what the perfectly competitive firm is balancing when determining to build one more unit.
2. Solve for the firm's supply function.

Now: \( p = $23 \)

4. Solve for the Elasticity of Demand.
5. Explain with words/graph how the introduction of a tax will impact consumers and producers.
\[ c(q_s) = 1500 + q_s^4 + 3q_s \]

\[ \therefore mc = \frac{1}{q_s^3} + 3 \]

and

\[ \left( \frac{mc}{MR} = P \right) \quad \therefore \text{added benefit equals added cost} \]

\[ \frac{1}{q_s^3} + 3 = P \]

(2) \Rightarrow

\[ q_s = \left( \frac{P - 3}{4} \right)^{\frac{1}{3}} \]

(3)

\[ \frac{\partial q_s}{\partial p} \cdot \frac{p}{q_s^2} \bigg|_{q_s} = \frac{p}{q_s^2} \bigg|_{q_s} \]

\[ P = \$23 \Rightarrow q_s^* = (5)^{\frac{1}{3}} \]

\[ \frac{\partial q_s}{\partial p} = \frac{1}{3} \left( \frac{P-3}{4} \right)^{-\frac{2}{3}} \cdot \frac{1}{4} = \frac{1}{12} \left( \frac{P-3}{4} \right)^{-\frac{2}{3}} \]

*use chain rule*
\[ \varepsilon_{Qd} = \frac{1}{12} \left( \frac{23 - 3}{4} \right)^{2/3} \cdot \frac{23}{(5)^{1/3}} \]

\[ = \frac{1}{12} \left( \frac{20}{4} \right)^{2/3} \cdot \frac{23}{(5)^{1/3}} \]

\[ = \frac{23}{12 \cdot 5} = \frac{23}{60} < 1 \]

\[ \therefore \text{ inelastic} \]

\[ \Theta \]

\[ \varepsilon_{Qd} = \frac{\partial q_d}{\partial p} \cdot \frac{p}{q^*_d} \bigg|_{q^*_d} \]

\[ p = \$23 \Rightarrow q^*_d = \frac{250}{23} - 2 \]

\[ = -\frac{250}{(23)^2} \cdot \frac{23}{\left(\frac{250}{23} - 2\right)} = -\frac{250}{(250 - 46)} \]

\[ = -\frac{250}{204} \therefore |\varepsilon_{Qd}| > 1 \therefore \text{ elastic} \]
Producers bear more of the burden of this tax.