

Elasticity of Demand Problems

MATH 104 and Math 184

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1. The current toll for the use of a highway is \$2.50. Drivers use this highway because of its convenience even though there are other routes that are free. The provincial government does a study that determines that a toll of p dollars means q cars will use the road, where

$$q = 60000e^{-0.5p}.$$

Compute the elasticity ϵ at $p = 2.50$ and use it to determine whether an increase in the toll will increase or decrease revenue.

ANSWER: $\epsilon(p) = -\frac{p}{2}$, so $\epsilon(2.50) = -1.25$. Since $|\epsilon(p)| > 1$, decreasing price increases revenue.

2. Currently 1800 people ride a commuter passenger ferry each day and pay \$4 for a ticket. The number of people q willing to ride the ferry at price p is determined by the relationship

$$p = \left(\frac{q - 3000}{600} \right)^2.$$

The company would like to increase its revenue. Use the price elasticity of demand ϵ to give advice to management on whether it should increase or decrease its price per passenger.

ANSWER: $\epsilon(4) = -\frac{1}{3}$. This means raising the price will increase revenue.

3. A certain commodity satisfies the demand equation relating price, p , and quantity demanded, q ,

$$q = \frac{1000}{p^2}.$$

If the price of this commodity is lowered, will the revenue generated by its sales increase?

ANSWER: $\epsilon(p) = -2$, which is constant for all p . Since $|-2| > 1$, decreasing the price would mean an increase in revenue.

4. The price p (in dollars) and the demand q for a product are related by

$$p^2 + 2q^2 = 1100.$$

If the current price per unit is \$30, will revenue increase or decrease if the price is raised slightly?

ANSWER: Note that $p = 30$ corresponds to $q = 10$. Use implicit differentiation to get dq/dp . $\epsilon(30) = -\frac{9}{2}$. The demand for this product is elastic, so increasing the price slightly will decrease revenue.

5. A cell phone supplier has determined that demand for its newest cell phone model is given by

$$qp + 30p + 50q = 8500,$$

where q is the number of cell phones the supplier can sell at a price of p dollars per phone. If the current price is \$150, will revenue increase or decrease if the price is lowered slightly? What price should the cell phone supplier set for this cell phone to maximize its revenue from sales of the phone? Use the price elasticity of demand to solve this problem.

ANSWER: Note that $p = \$150$ corresponds to $q = 20$. Use implicit differentiation to find dq/dp . $\epsilon(150) = -\frac{15}{8}$. Demand is elastic, so a slight price decrease will increase revenue. Solve $\epsilon(p) = -1$ to find that price $p = \$80$ maximizes revenue.