

**3.6 AN ECONOMICS APPLICATION: ELASTICITY OF DEMAND**

Basic Economics lesson ... As demand increases (or supply decreases) prices usually increase. What about the other way?

How does an increase in price affect Demand? Does it matter how much the price is increased? Does the product itself matter? ... in other words is the demand for some products affected less by a price increase than others?

These are the questions that are dealt with when we consider “elasticity” of demand.

Products can be *elastic* or *inelastic*. Without being too technical (aka economically accurate), a product whose demand is highly inelastic stays in high demand even though the price might increase. Alternately, a product whose demand is highly elastic experiences a dramatic decrease in demand when the price is increased.

Think about it in more personal terms ... Suppose the price of gasoline goes up \$0.20 a gallon tomorrow. While your driving habits might be impacted in some way, most of us still have to go to work, school, shopping, etc. We say that gasoline has an \_\_\_\_\_ demand.

If the prices of new cars increases 10% tomorrow, then the number of new cars sold will decrease dramatically. We say that new cars have an \_\_\_\_\_ deman.

Elasticity of demand is simply a way to quantify the relationship between the decrease in demand associated with an increase in price.

*Example:* Let  $x$  represent the price of a single item.

If we increase the price of the item, the percent change in price is given by \_\_\_\_\_.

Similarly, if we let  $q$  represent the quantity sold (meaning  $q$  can also be considered the demand function  $D$ ), then the percent change in the quantity sold is given by \_\_\_\_\_.

*Example:* **Elasticity** of demand is the ratio of the percent change in demand to the percent change in price. That is

*Example:* In calculus, a small change in a  $x$  is written as  $dx$ . Using this notation with the ratio above gives us

*Example:* Replacing  $q$  with the demand function  $D$  and considering that demand usually decreases as price increases we can write the “elasticity of demand” as

*Example:* Find the elasticity if  $q = D(x) = 400 - x$  and  $x = 125$ .

There are TWO simple ways to increase profit ... either increase revenue or decrease cost.

We're going to focus on increasing revenue.

*Example:* If the price of an item is  $x$  and the quantity sold is  $D(x)$ , then what is the revenue equation?

*Example:* Maximize the revenue function you just wrote.

In Summary ...

$E = 1$	% change in quantity = % change in price	Revenue is Maximized	"Unit elasticity"
$E < 1$	% change in quantity < % change in price	Revenue is INCREASING	Demand is Inelastic
$E > 1$	% change in quantity > % change in price	Revenue is DECREASING	Demand is Elastic

*Example:* High Wire Electronics determines the following demand function for a new game:  $q = D(x) = \sqrt{200 - x^3}$ , where  $q$  is the number of games sold per day when the price is  $x$  dollars per game.

a) Find the elasticity.

b) Find the elasticity when  $x = 3$ .

c) At  $x = 3$ , will a small increase in price cause the total revenue to increase or decrease?