- Elasticity of Demand

Consider the demand of a commodity, usually x.
we can represent x as a function of the unit price:

$$x = f(p)$$

Elasticity of Demand: $E(p) = \dfrac{-pf'(p)}{f(p)}$

3 types of Results

1. Demand is Elastic if $E(p) > 1$ — increase in unit price, decrease in revenue. or decrease in price, increase in revenue
2. Demand is Irelastic if $E(p) < 1$ — increase price, increase rev. or decr. price, decr. rev
3. Demand is unitary if $E(p) = 1$
   - small increase or decrease in price will keep revenue roughly the same.

ex

Titan Tires has determined that the quantity demanded, x, of their tires per week is related to the price, p, by $x = \sqrt{144-p}$, $0 \le p \le 144$.

Is the demand Elastic, Irelastic, or Unitary at $p = 63$, $p = 96$, $p = 108$

$$x = f(p) = \sqrt{144-p}$$

$$f'(p) = \frac{1}{2}(144-p)^{-1/2} \cdot -1 = -\frac{1}{2\sqrt{144-p}}$$

$$E(p) = \frac{-p\left(-\frac{1}{2\sqrt{144-p}}\right)}{f(p)}$$

@ $p=63$ $E(p)<1$ Irelastic. Charge more for tires to increase revenue

$$E(63) = \frac{-63\left(-\frac{1}{2\sqrt{144-63}}\right)}{\sqrt{144-63}} = \frac{63}{162}$$

@ $p = 96$ $E(p)=1$ unitary
a good price to pick

$$E(96) = \frac{-96\left(-\frac{1}{2\sqrt{144-96}}\right)}{\sqrt{144-96}} = \frac{96}{96} = 1$$

@ $p=108$ $E(p)>1$ Elastic.
too high so we can drop price to increase revenue

$$E(108) = \frac{-108\left(-\frac{1}{2\sqrt{144-108}}\right)}{\sqrt{144-108}} = \frac{108}{72}$$