ECO100: Introductory Economics
Elasticity

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(own-) price elasticity of demand

1 price responsiveness matters
2 what we want: measure responsiveness of Q^d to changes in its own-price.

hurdles

1 Is \$1 a big or small price change?
2 Is 100 a big or small quantity change?
- related: 100 medium cups of coffee equals 35,488.24 mL

solution

compare $\%\Delta Q^D$ (percent change quantity demanded) to $\%\Delta P$ (percent change in price)

baseline definition

- given a price change, demand is elastic if the resulting $|\%\Delta Q^D|$ is **greater than** the $|\%\Delta P|$
- given a price change, demand is inelastic if the resulting $|\%\Delta Q^D|$ is **less than** the $|\%\Delta P|$

our preferred measure: $\epsilon_{Q_i^D, P_i}$

$$\epsilon_{Q_i^D, P_i} = \frac{|\%\Delta Q_i^D|}{|\%\Delta P_i|}$$

interpretation

determinants of (own-price) elasticity of demand

two observations

1. price elasticity measures the willingness and ability to substitute away from a good (at current prices) when faced with $\uparrow P$
2. doing without is always a potential substitutes, albeit not always a particularly good one

the one rule you need to remember

calculating (own-price) elasticity of demand

How you calculate elasticity of demand depends on the information you have ...

- Sometimes, you have two observations
  (e.g., $\{Q_a^D, P_a\}$ and $\{Q_b^D, P_b\}$)

- Sometimes, you have an (estimated) demand function
  (e.g., $P(Q) = 200 - 2 \times Q$)

calculating (arc) elasticity of demand

ex: two points on demand curve: $\left\{ Q_a^D = 8, P_a = \$3.50 \right\}$ and $\left\{ Q_b^D = 10, P_b = \$2.50 \right\}$

problem: want same value for $a \to b$ as $b \to a$

- $\left| \%\Delta Q^D \right|$

$$\underbrace{\left| \frac{8 - 10}{8} \right| = \frac{2}{8}}_{a \to b} \neq \underbrace{\frac{2}{10} = \left| \frac{10 - 8}{10} \right|}_{b \to a}$$

solution: use "change relative to average" (midpoint method)

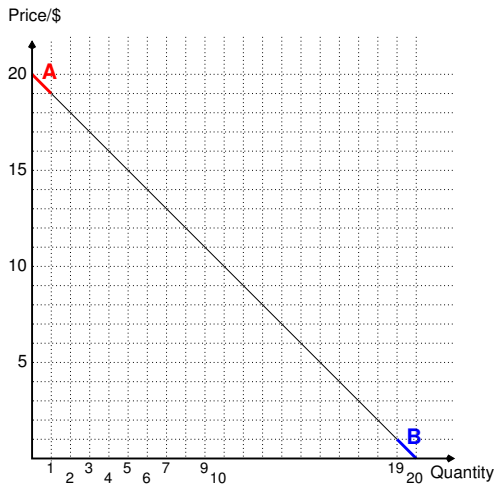# calculating point elasticity of demand
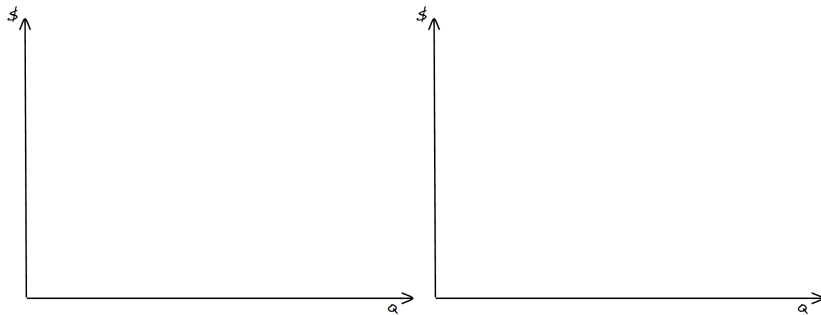**momentarily avert your eyes if you are allergic to calculus**

linear demand: $Q(P) = 100 - \frac{1}{2} \times P \leftrightarrow P(Q) = 200 - 2 \times Q$

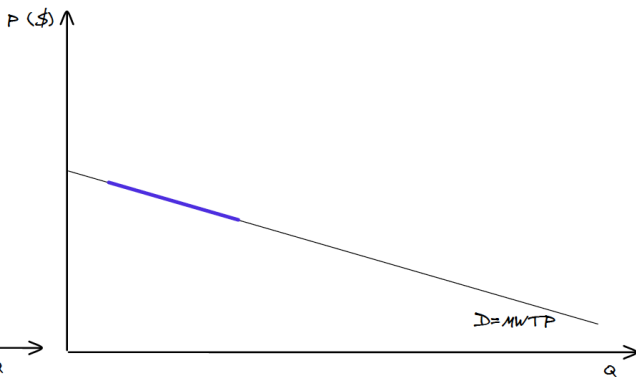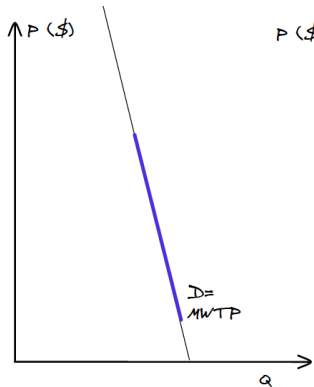# price elasticity and the linear demand curve
example: $Q^D = 20 - P$

the art of drawing demand curves I

the art of drawing demand curves II

total revenue (*TR*) and price elasticity of demand

$TR = P \times Q$, Profits=TR-Total Costs $\Rightarrow$ **TR $\neq$ Profits**

$\uparrow P$ has 2 effects on amount of money into sellers' pockets:

1. price effect:

2. quantity effect:

the general rule

elasticity: "It's all the same damn thing, man."

-Janice Joplin (rock and roll goddess)

other elasticities of demand

income elasticity of demand ϵ_I

percentage change in the quantity demanded that results from a 1 percent change in the income

cross-price elasticity of demand $\epsilon_{Q_A^D P_B}$

percentage change in quantity demanded of good *A* given a 1 percent change in the price of good *B*

elasticity of supply: defined

the definition

the cases

1 perfectly inelastic supply: $\epsilon_{Q^s} = 0$

2 inelastic supply: $\epsilon_{Q^s} < 1$

3 unit elastic supply: $\epsilon_{Q^s} = 1$

4 elastic supply: $\epsilon_{Q^s} > 1$

5 perfectly elastic supply: $\epsilon_{Q^s} = \infty$

determining elasticity of supply

the big question

If firms saw an increase in price, how easy would it be for them to increase output?

the two (and one-half) determinants

elasticity of supply 1: manufacturing in China

observation

over the past 20 years, Chinese manufacturing output has
increased markedly while still remaining competitive.

implications for supply curve

how explain?

supply elasticity 2: the effects of Hurricane Katrina

background: refineries take crude oil $\longrightarrow$ gasoline

the Gulf of Mexico, circa 2005

- Approximately 25% of U.S. crude oil production
- Major U.S. refining centre (almost 50% U.S. capacity)
- Major port of entry for imported crude (over 10% U.S. imports)
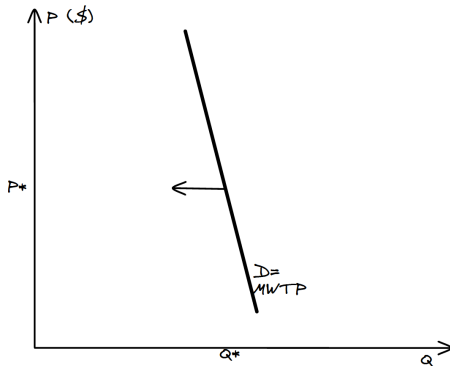
the effects of Hurricane Katrina

- approximate 33% increase in P resulting from a 8% decrease in supply (shift in supply curve)

Hurricane Katrina and the price of gas
Is supply of refined gasoline more likely elastic or inelastic?
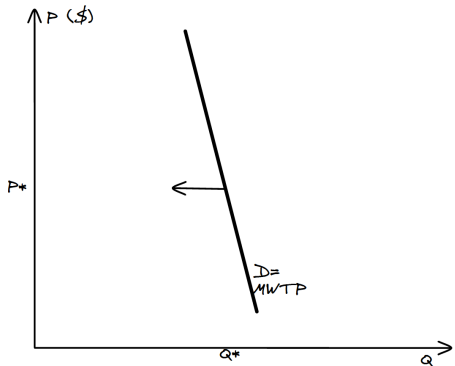
(a) shift elastic supply curve

(b) shift inelastic supply curve

Is the more likely assumption a good assumption?