Appendix: Making & Using Graphs

- Why bother?
- Graphs & Data
- Graphs & Models
- Equations and it's Slopes

Why bother?

- visual relationship between to variables
- analyze & understand

  -- information

  -- ideas

- **"A picture is worth a thousand words"**
  - corny, but true
  - a graph conveys info more clearly & quickly than words

Graphs & Data

- scatter diagram

-- graph “x” value that corresponds to “y” value

-- relationship between x and y

  -- do they move in same direction?

  -- opposite direction?

  -- varied directions?

Example: Pense numa função definida por:

f(x) = x,

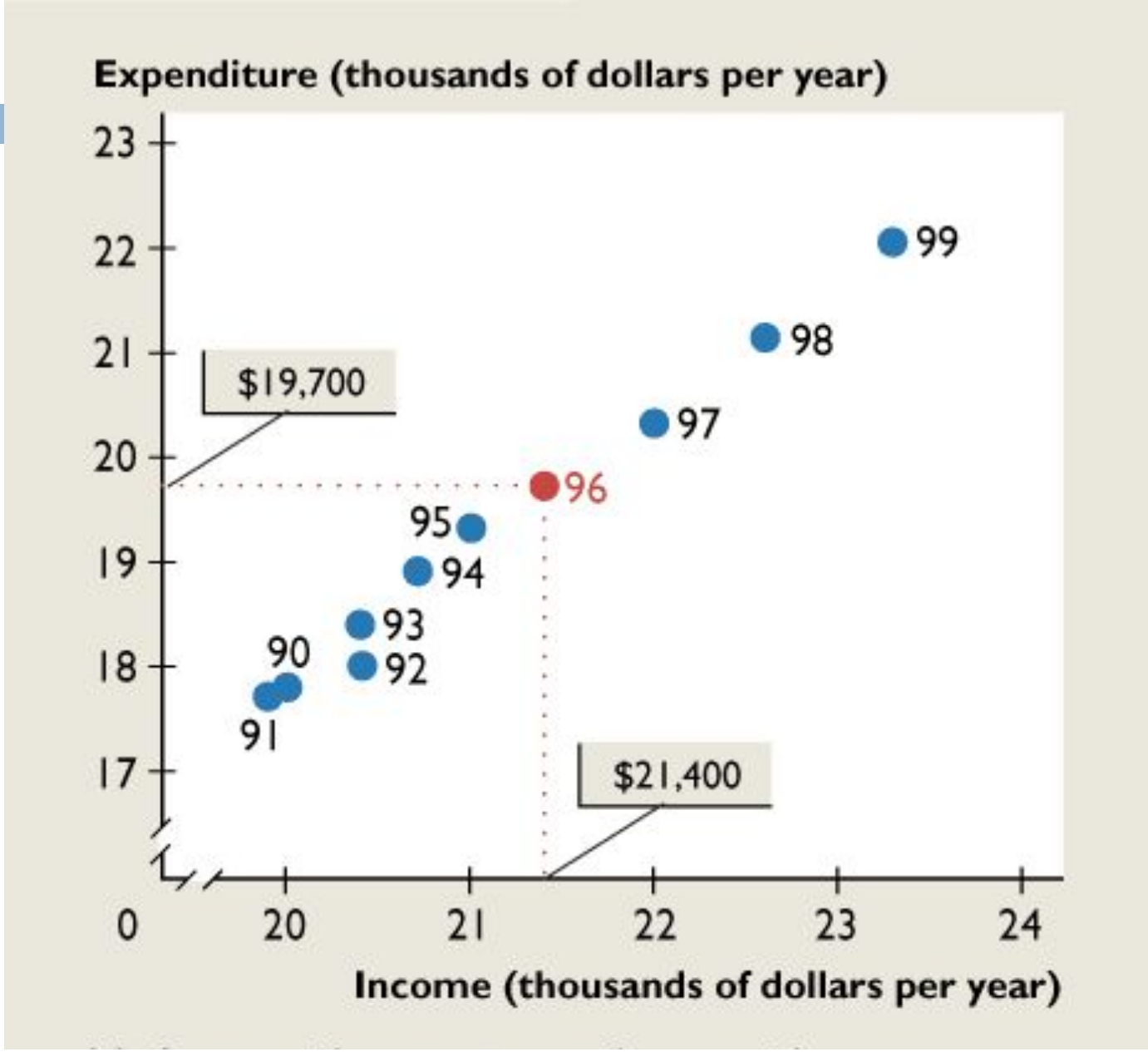
Isso implica que "y" depende dos valores de "x".

f(x) ou y	x
0	0
1	1
2	2
3	3
4	4

Example: consumption & income

each point = 1 year

Conclusion: as income rises, so does consumption



time-series graph

-- measures the behavior of a variable over time

-- x axis = time

-- y axis = variable

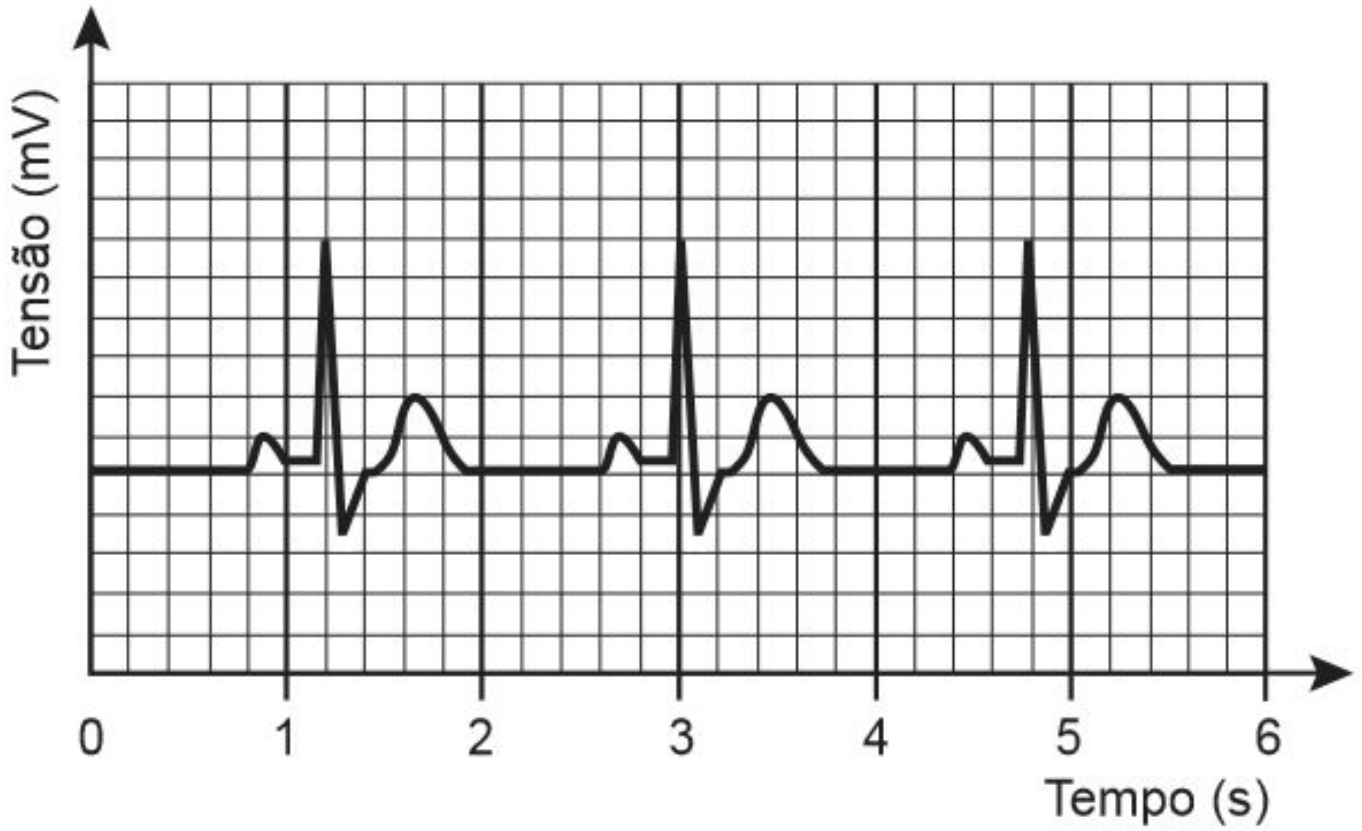
-- Is variable

high or low?

rising or falling?

stable or volatile?

time-series graph



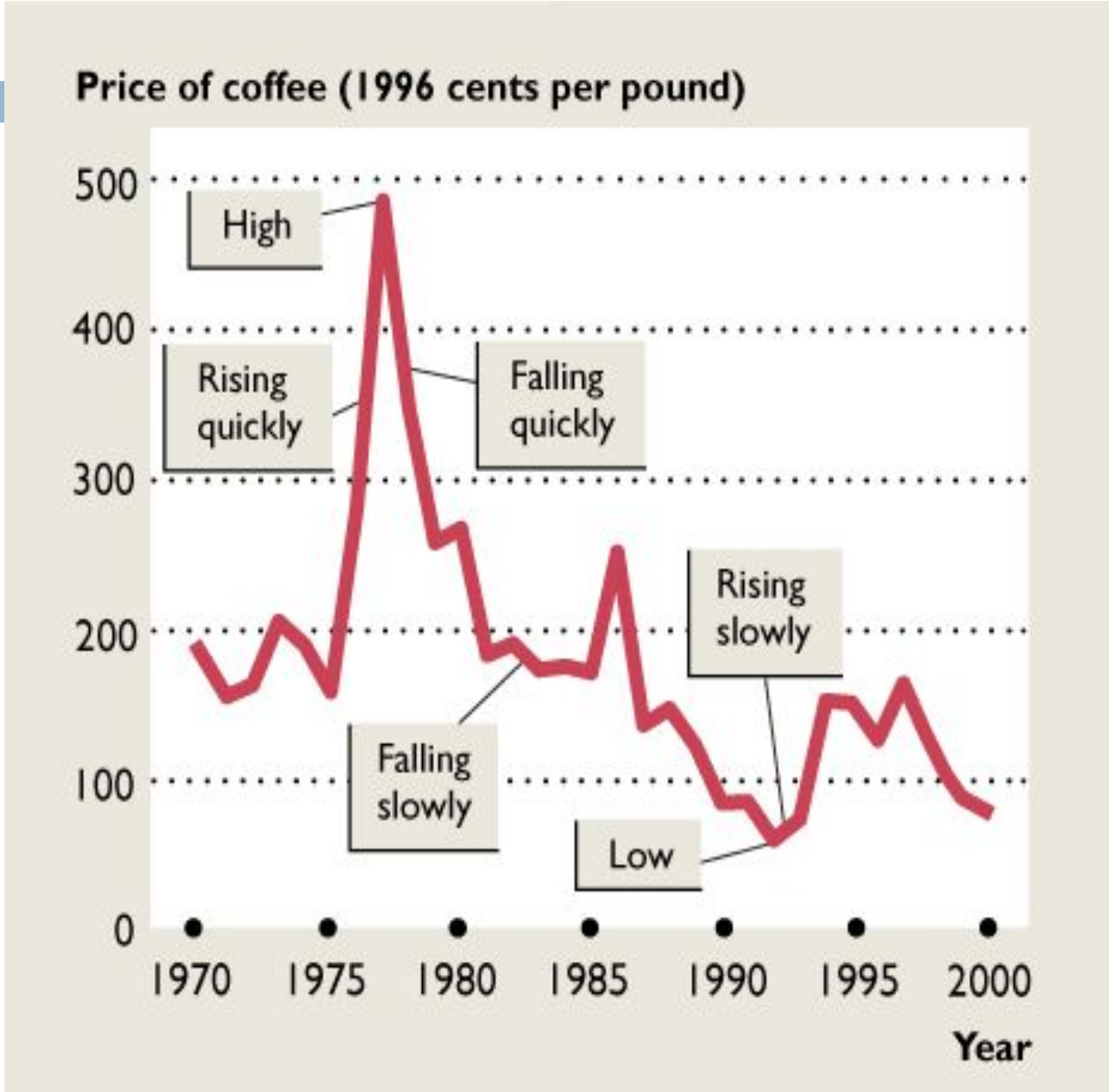
time-series graph

example: price of coffee

price is volatile

no long-term trend of rising or falling

price ranged between $1-$5 per lb.



- cross-section graph

-- looks at value of one variable

for different groups,

at single point in time

-- compare outcomes for different groups

example: income per person

compare income across cities in 1995

example: Brazilian Rice Consumption

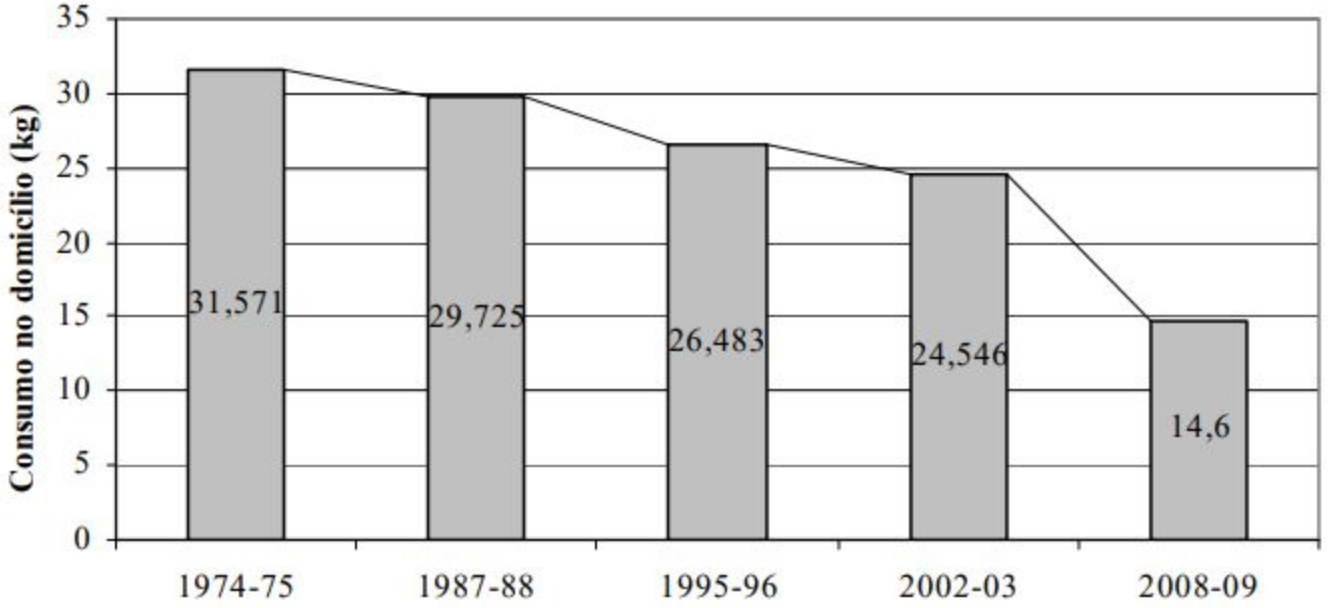


Gráfico 2.1 – Quantidade[1] anual *per capita* de arroz polido adquirido para consumo – Brasil (1974-75 a 2008-09)

Fonte: IBGE, Estudo Nacional de Despesas Familiar 1974-75; e Pesquisa de Orçamentos Familiares.

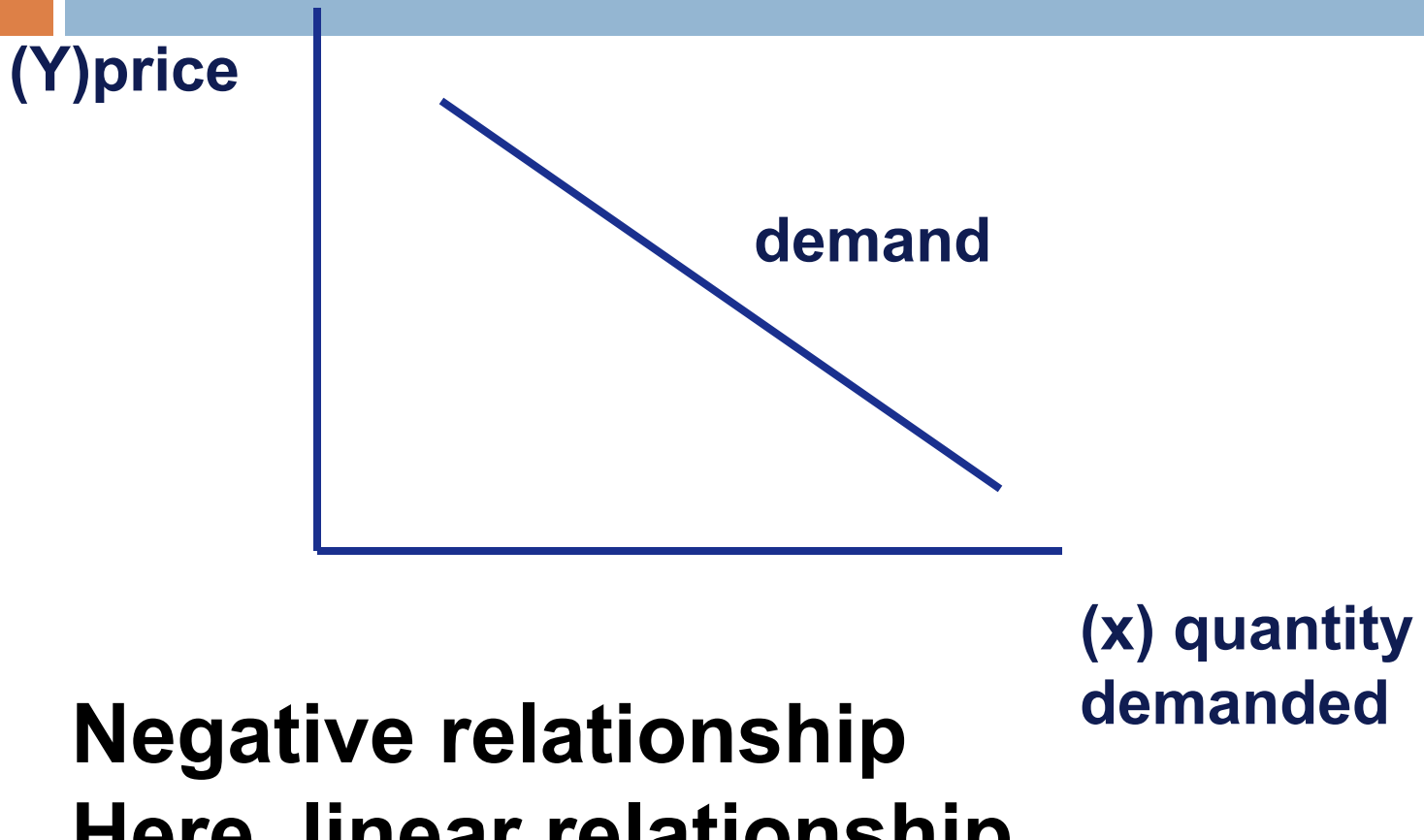
[1] – em kg

Graphs & Economic Models

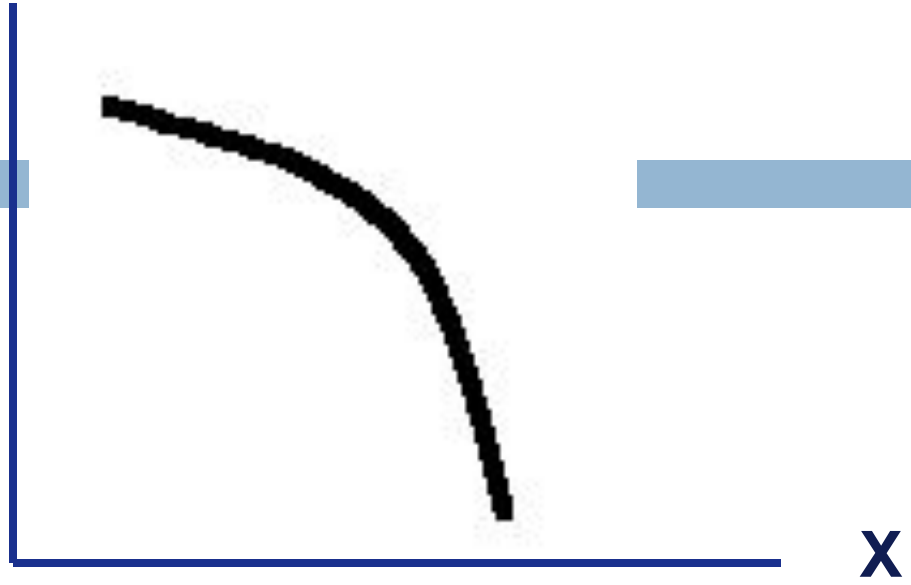
- how do variables move together?
- positive relationship

  -- variables move in same direction
- negative (inverse) relationship

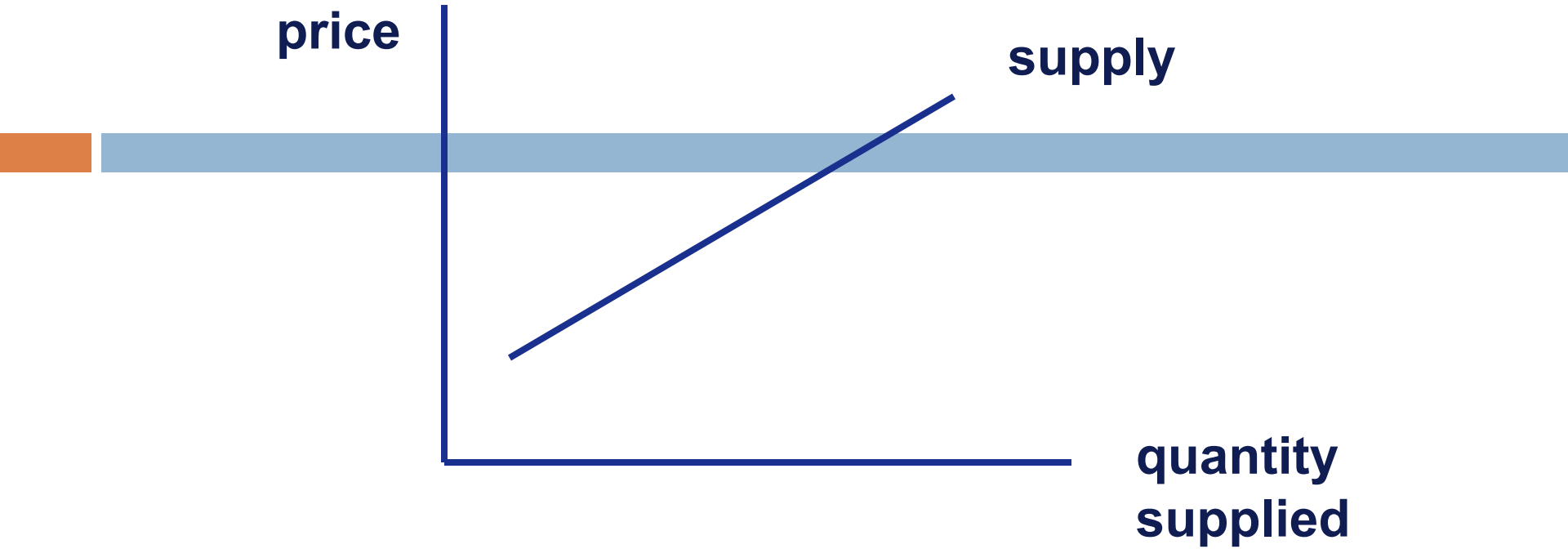
  -- variables move in opposite direction



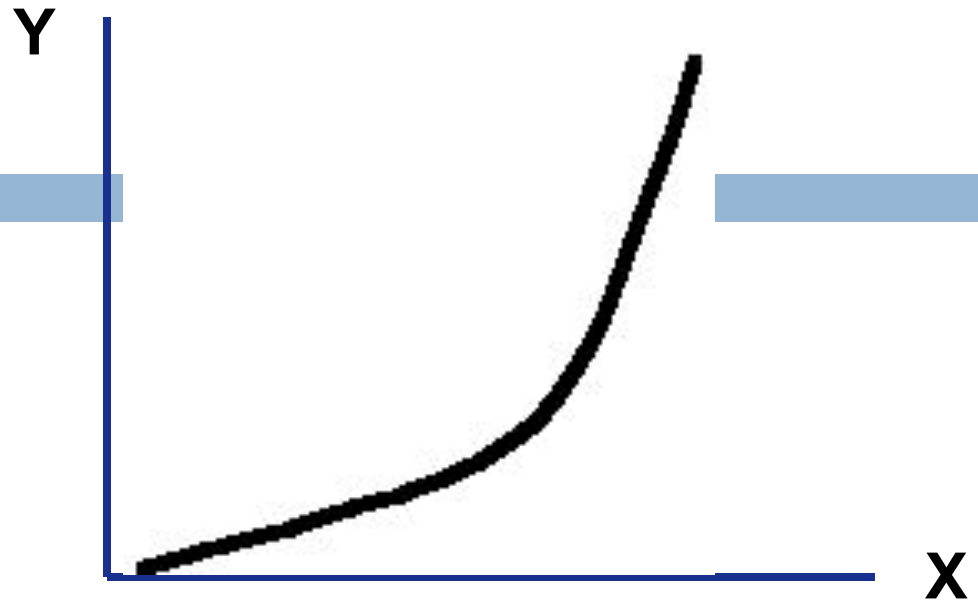
Negative relationship
Here, linear relationship



Negative relationship but not linear

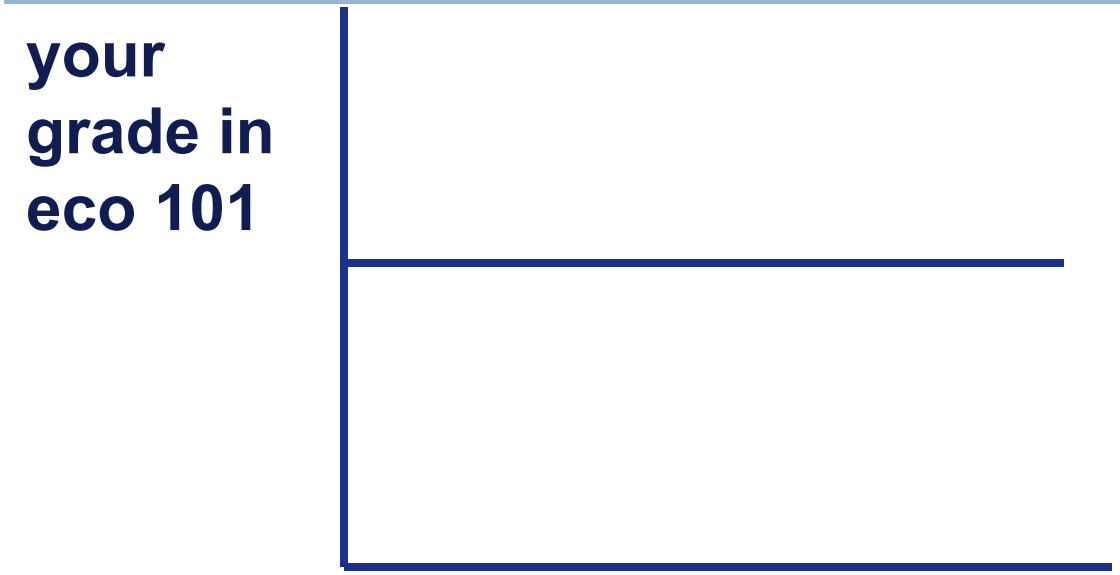


positive relationship
Here, linear relationship



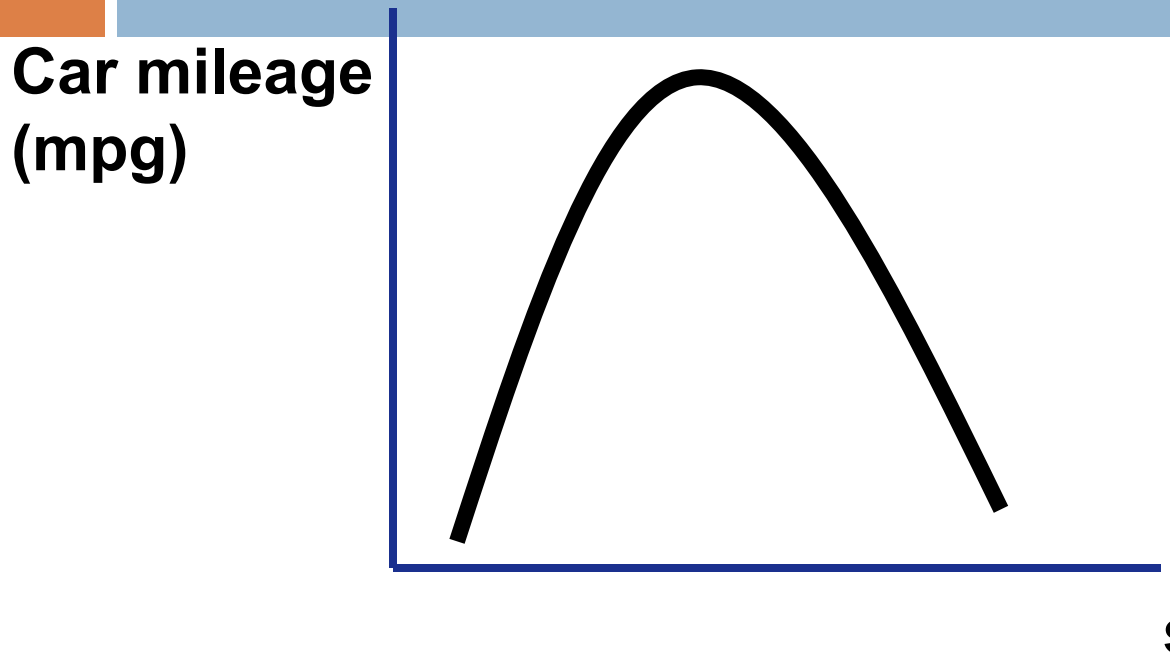
Positive relationship
but not a linear relationship

example: think about the relation between the tea price and your grade…describe it…



No relationship

Your grade is independent of price of tea in China



Changing relationship

Car mileage at first rises, then falls as speed rises

Slope

- quantifies relationship between two variables

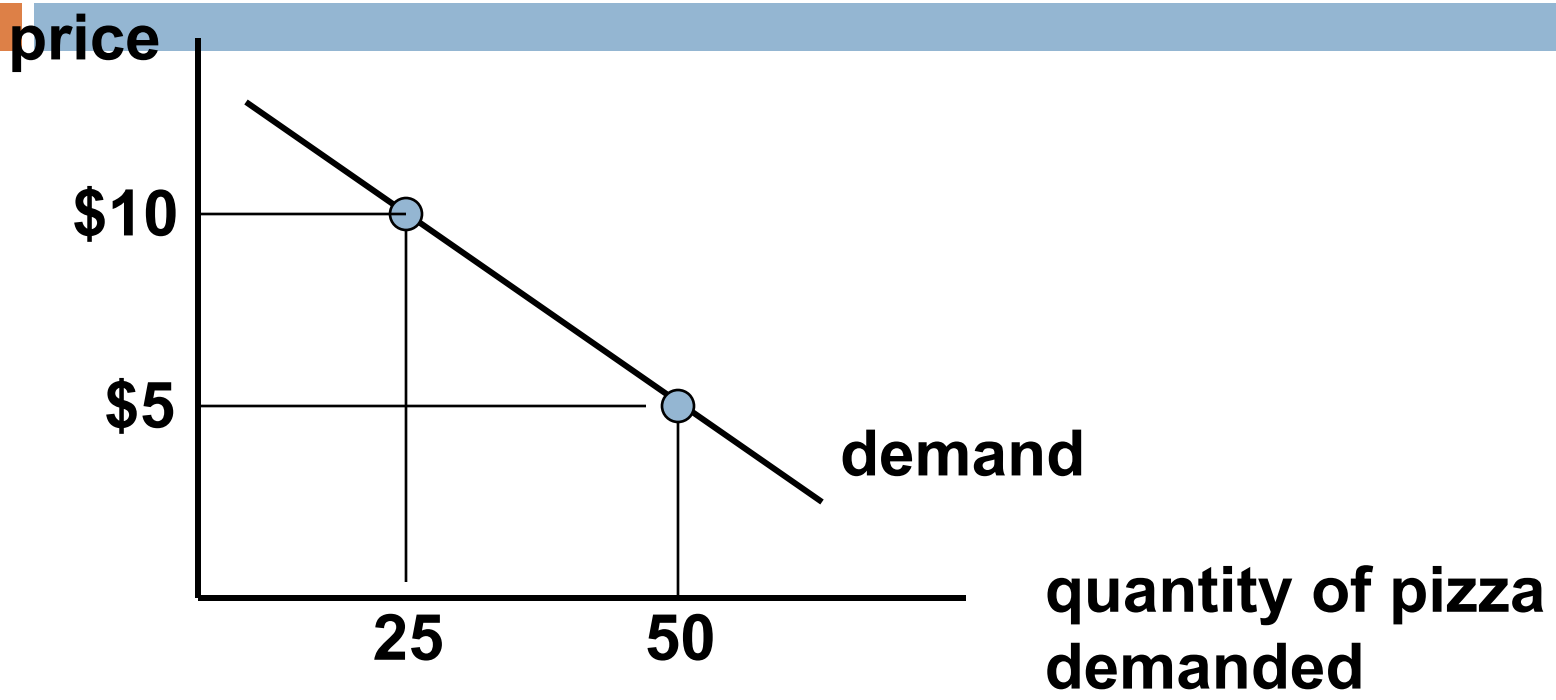
$$\text{slope} = \frac{\text{change in y} - \text{axis value}}{\text{change in x} - \text{axis value}}$$

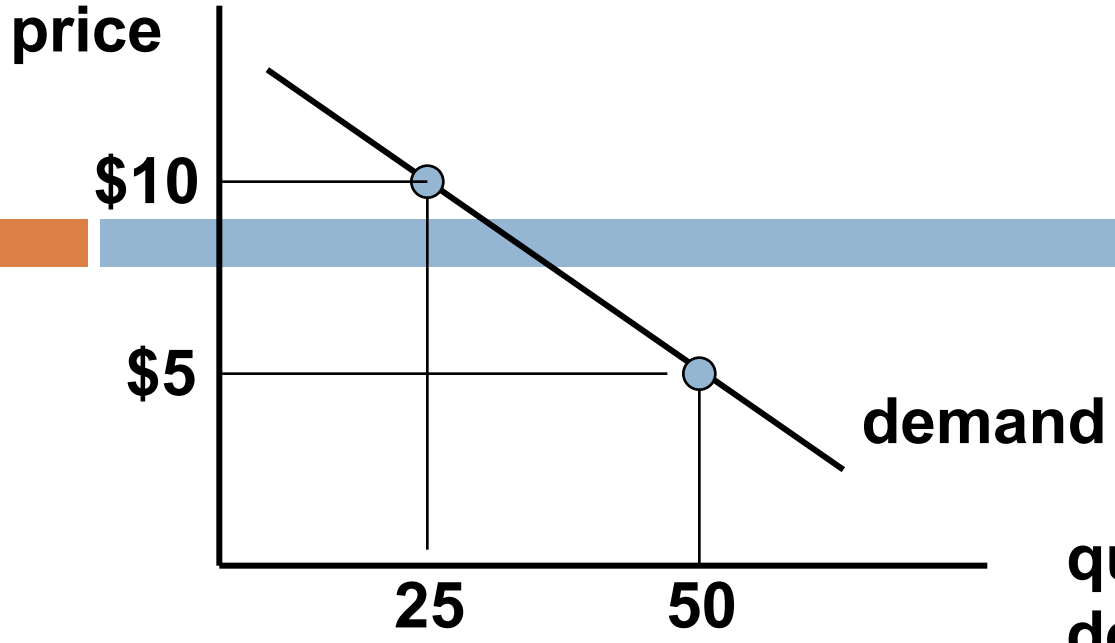
- line

  -- slope is constant
- nonlinear

  -- slope changes

example 1: Demand for pizza





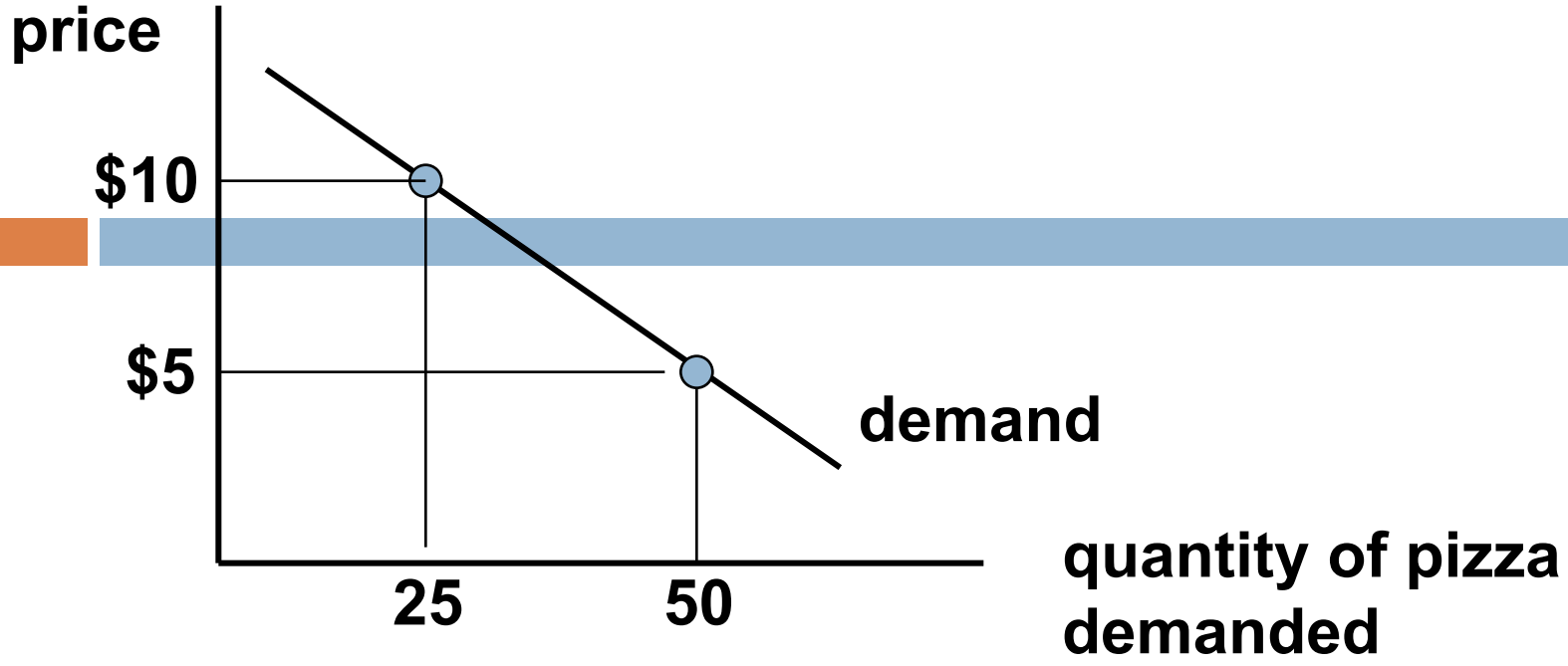
x1 = 25, y1 = 10
x2 = 50, y2 = 5

$$seno = \frac{cateto\ oposto}{hipotenusa}$$

$$cosseno = \frac{cateto\ adjacente}{hipotenusa}$$

$$tangente = \frac{cateto\ oposto}{cateto\ adjacente}$$

change in x = 25
change in y = -5



x1 = 25, y1 = 10

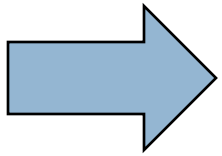
x2 = 50, y2 = 5

change in x = 25

change in y = -5

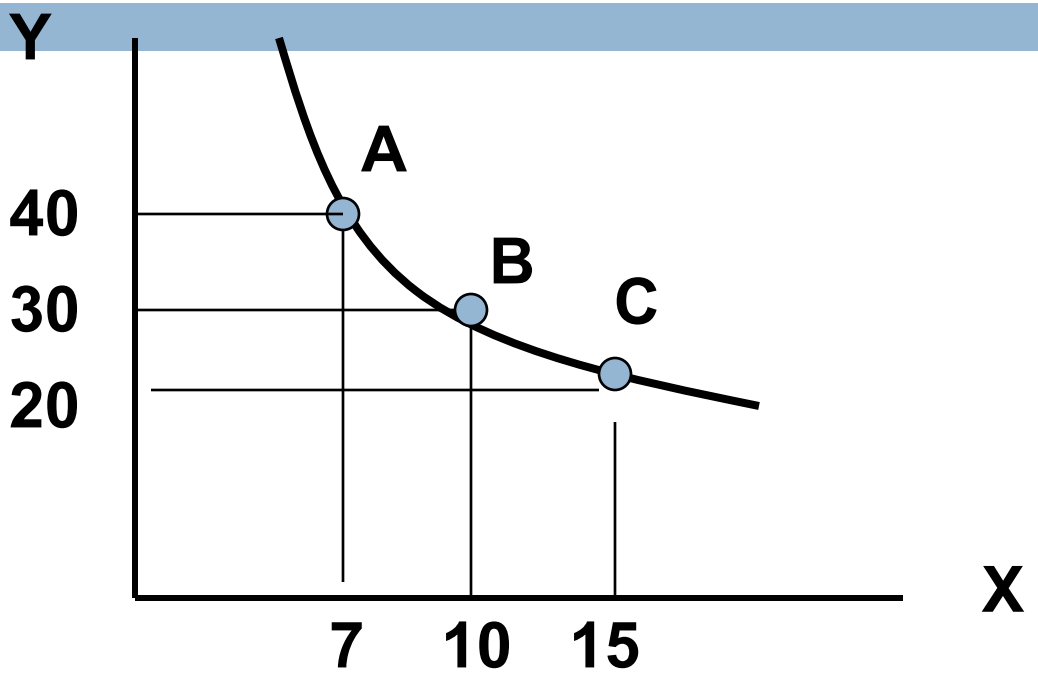
$$\text{slope} = \frac{\text{change in y} - \text{axis value}}{\text{change in x} - \text{axis value}}$$

$$\text{slope} = \frac{-5}{25} = -.2$$

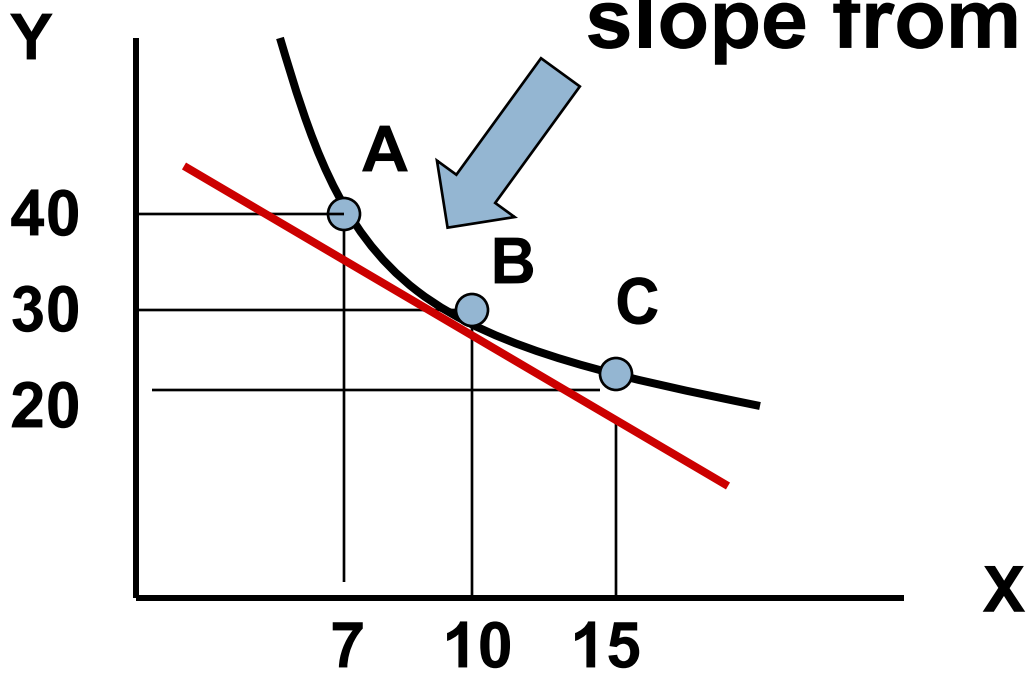
slope < 0  **negative relationship**

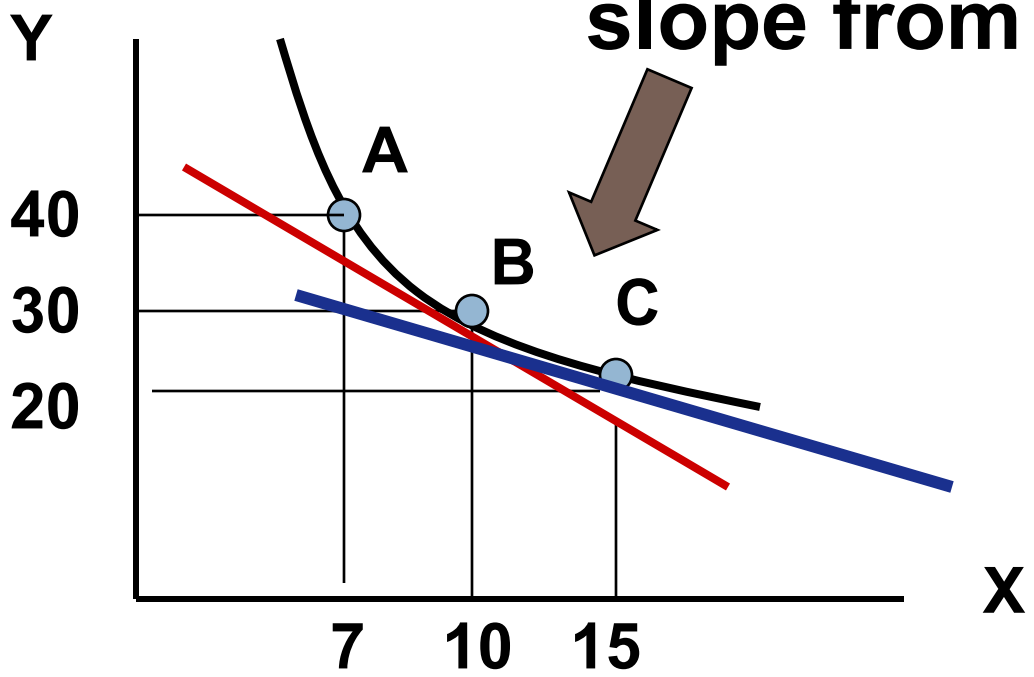
y=15-02x

example 2: nonlinear



slope from A to B





slope is flatter

Using graphs

- model markets
- production & costs
- competitive and monopoly firms
- explain wage behavior

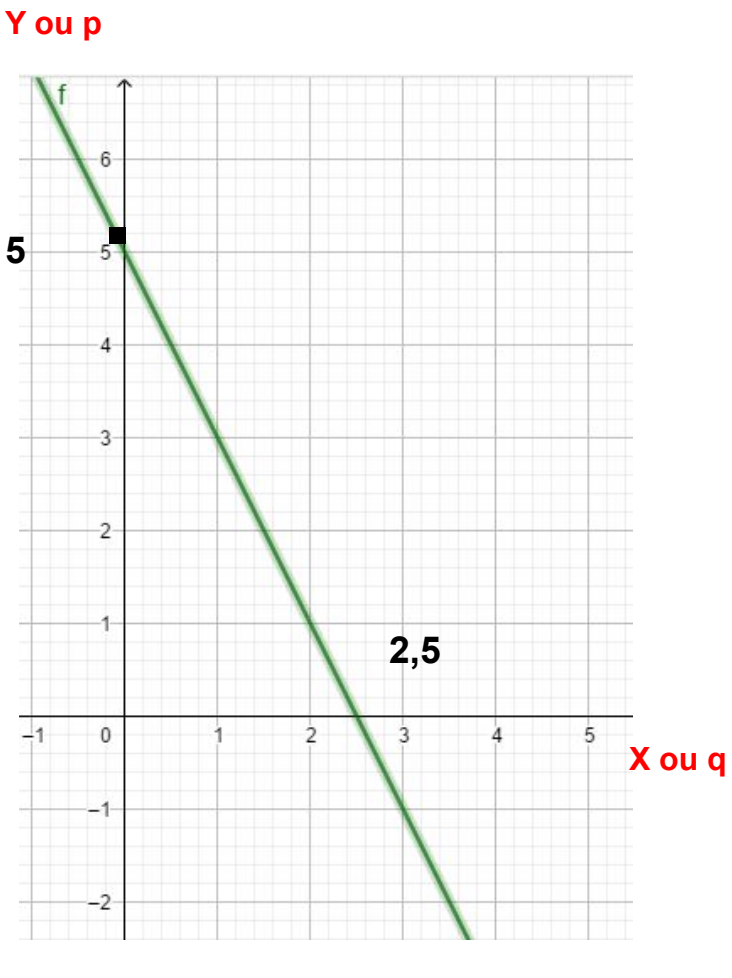
Equation:

- Então admitindo que q = f(p), podemos escrever a função demanda como:
- Qd = Constante (Alfa) – ß*Px, com ß<0 sempre.

- Px = Preço do Próprio bem x;
- Qd = Quantidade demandada de x;
- Constante (Alfa): Mede a altura que a função corta o eixo Y (Coeficiente linear);
- Beta (ß): Mede a angulação dado pela tangente.

more practice

- Exemplo: q = 5 -2p
- => Para utilizar o geogebra, devemos fazer a demana em sua forma invertida: p = 2,5 – q/2
- O **intercepto** pelo eixo vertical "y" é dado no número "5", ao passo que no eixo horizontal, é dado pelo valor correspondente a "x" quando y=0, ou no nosso caso, o valor de "p" corresponde a q = 0, assim substituindo o algarismo 0 na variável "q", temos: p = 2,5.
- Agora podemos traçar um gráfico:



more practice

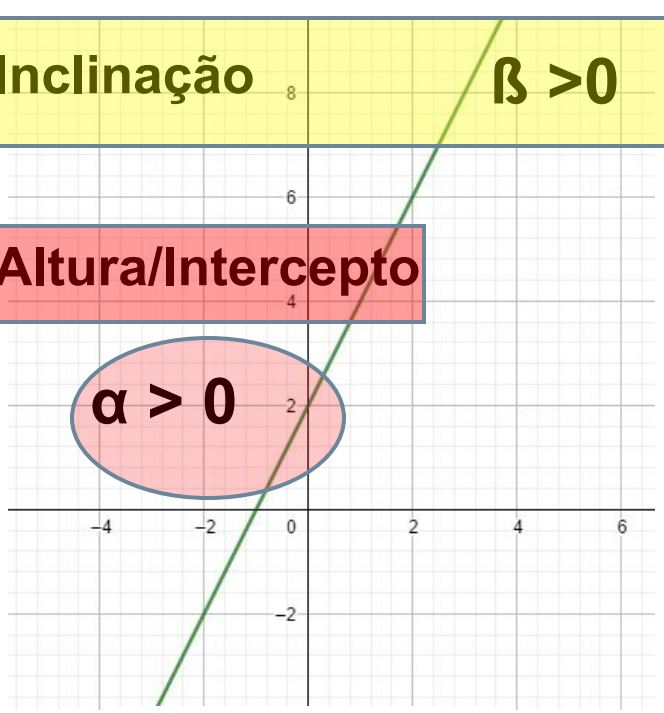
- Função de Primeiro Grau: $f(x) = \alpha \pm \beta x$

$f(x) = \alpha + \beta x$ $f(x) = \alpha - \beta x$ $f(x) = -\alpha - \beta x$

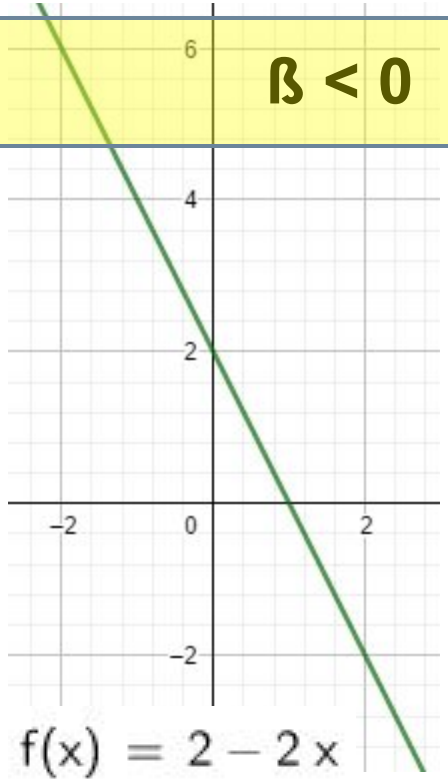
Inclinação ß >0 ß < 0 ß < 0

Altura/Intercepto

α > 0



f(x) = 2 + 2 x



f(x) = 2 − 2 x

Altura/Intercepto

α < 0

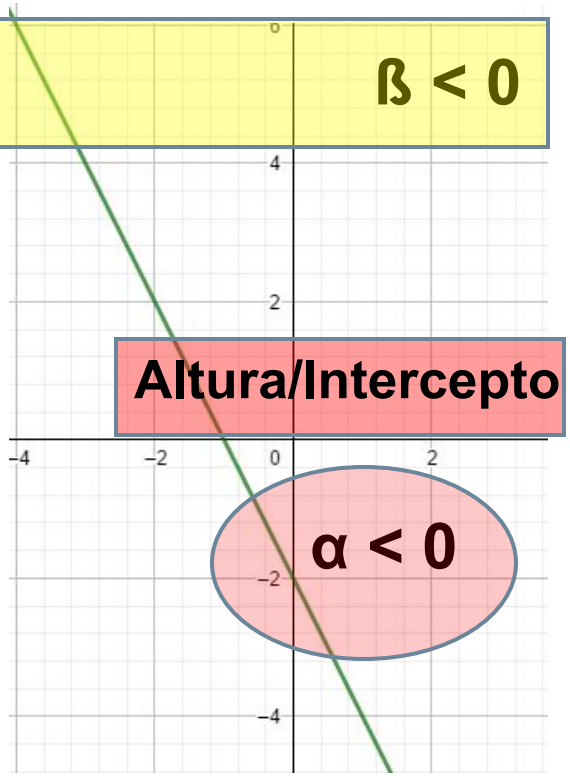


Gráfico de Funções: Transformação

- Função de Segundo Grau: Parábola $f(x) = \beta x^2$

$f(x) = \alpha + \beta x$ $f(x) = \alpha - \beta x$ $f(x) = -\alpha - \beta x$