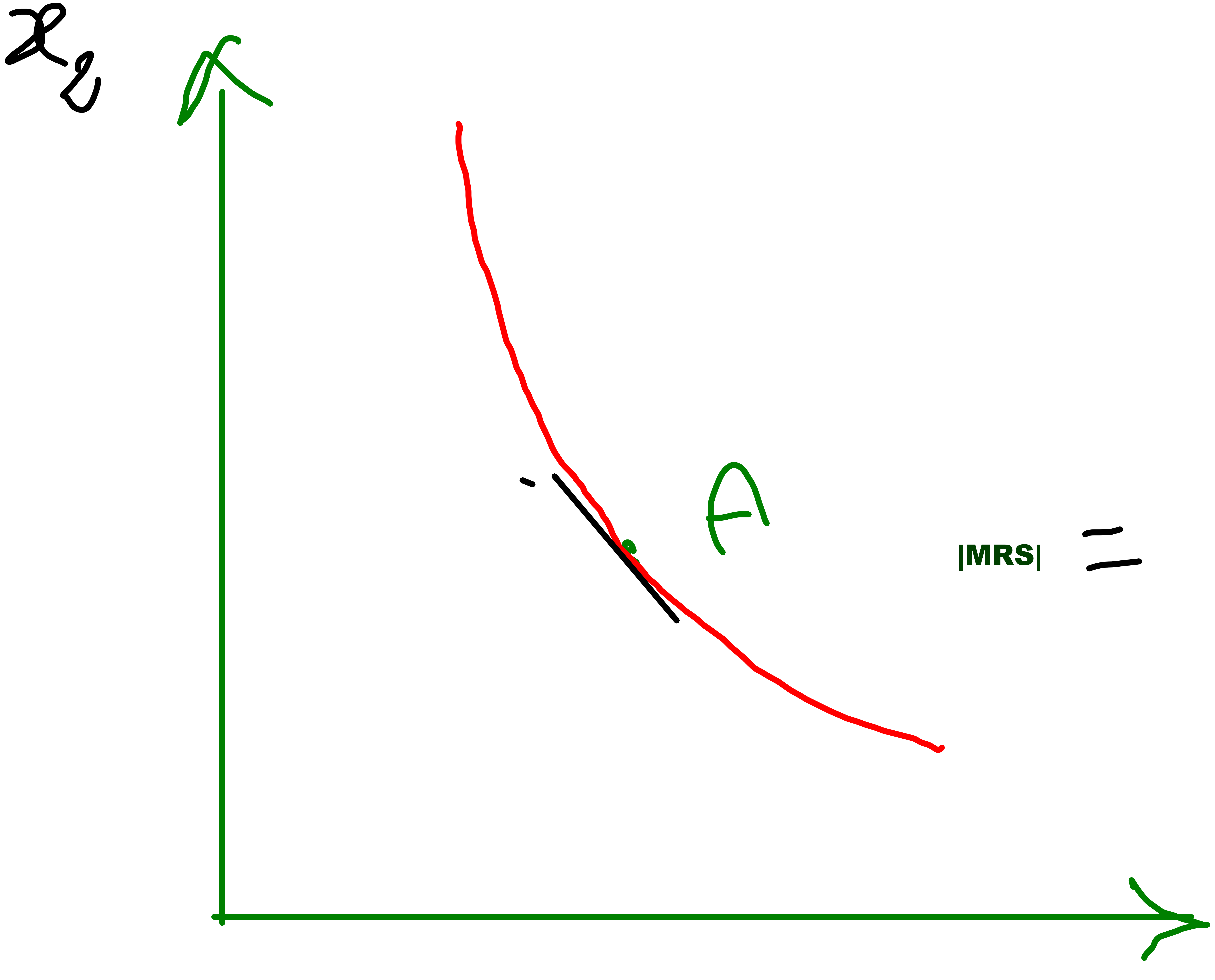


$$\frac{\Delta x_2}{\Delta x_1} = MRS$$

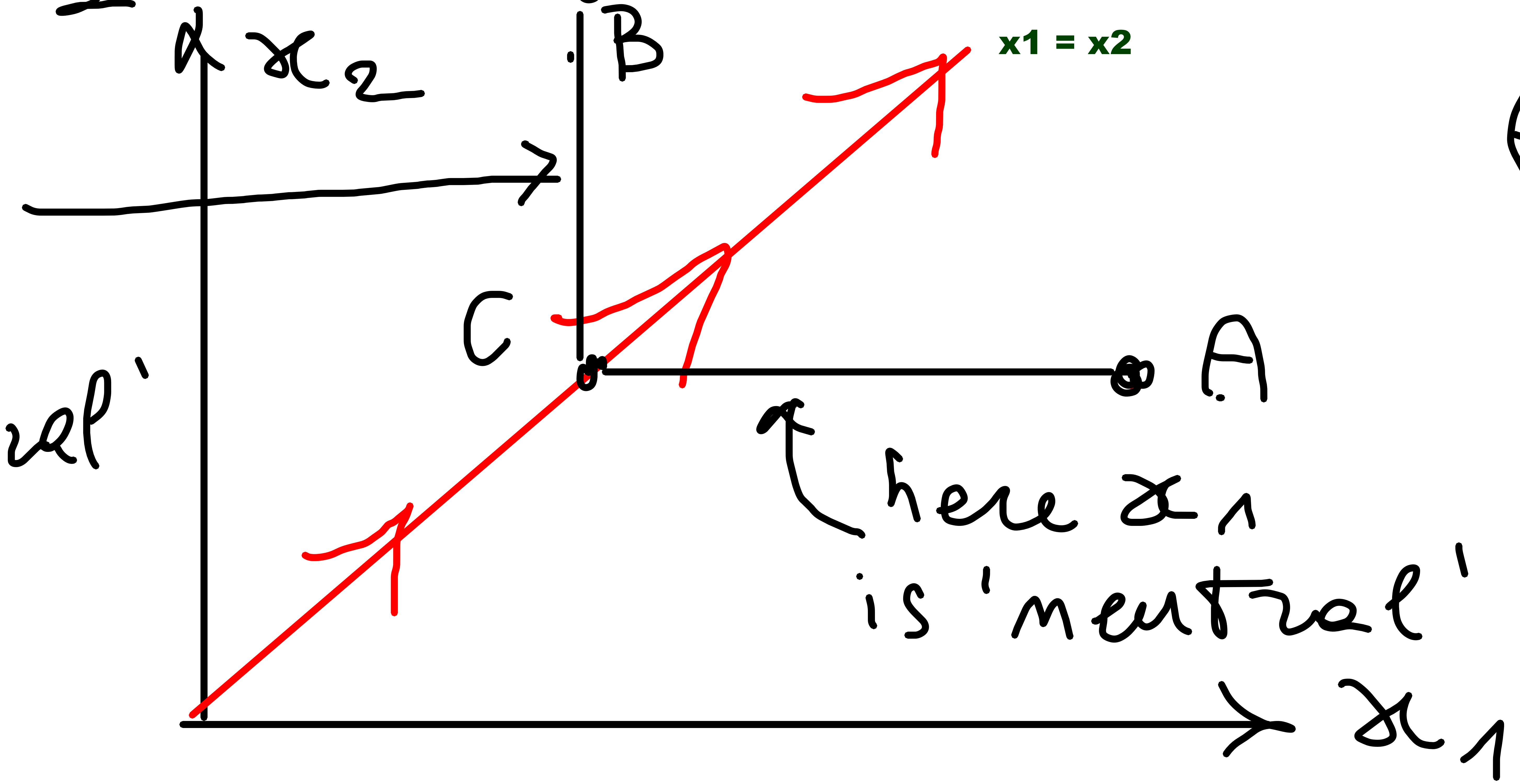
$|MRS|$ = marginal willingness to pay for x_1

Perfect complements

x_1 = coffee $\quad x_2$ = sugar

$\frac{x_2}{x_1} = 1$ desired ratio

here x_2 is 'neutral'

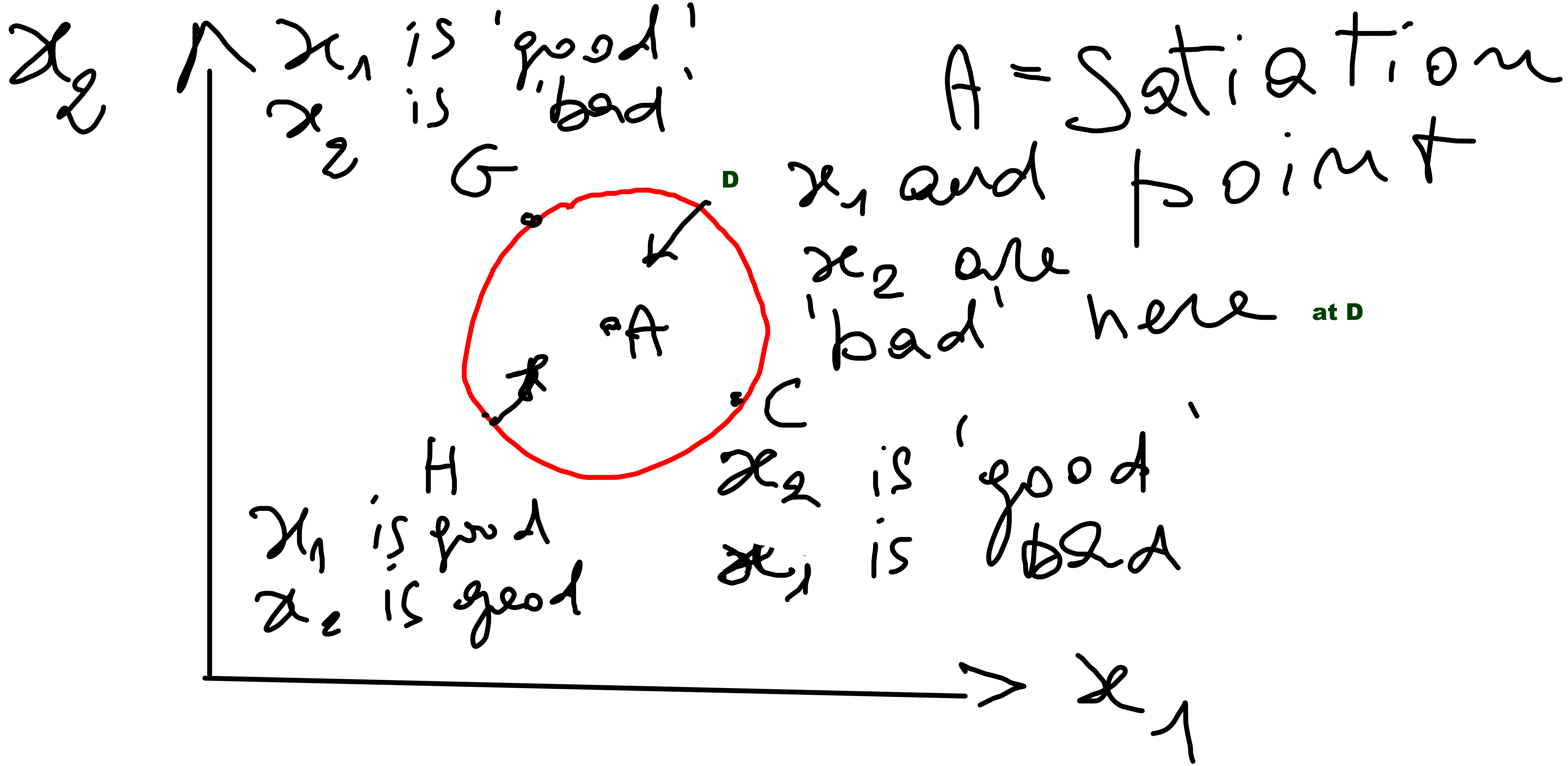


A: $\frac{x_2}{x_1} < 1$

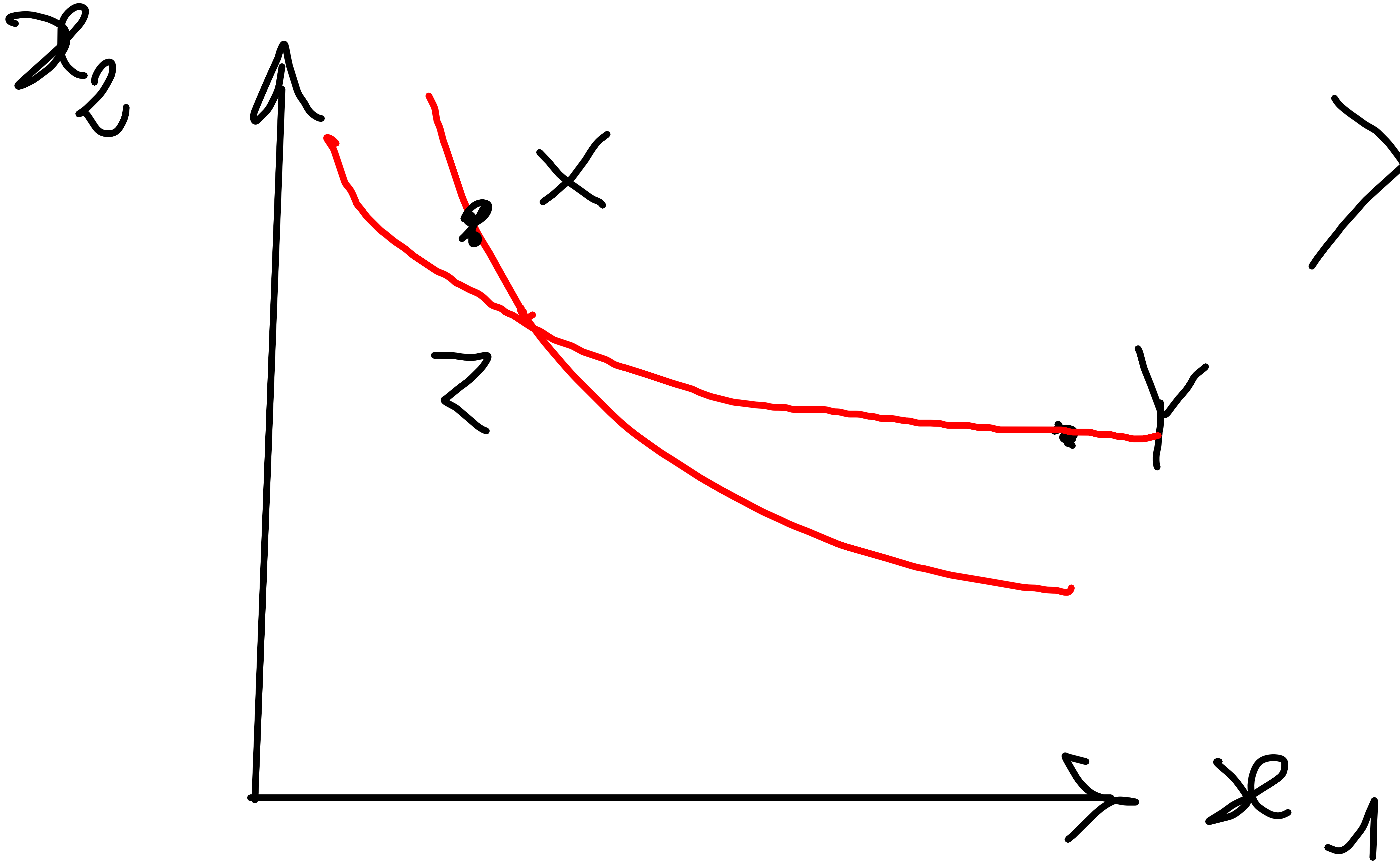
$C \sim A$

$B \sim A \sim C$

indifference curves are L shaped and form a 90° degree angle at the point of intersection with straight line of desired consumptopn ratio



x_2
x_1 is 'good'
x_2 is 'bad'
A = Satiation point
G
D
x_1 and x_2 are 'bad' here at D
A
C
H
x_1 is good
x_2 is good
x_2 is 'good'
x_1 is bad
x_1

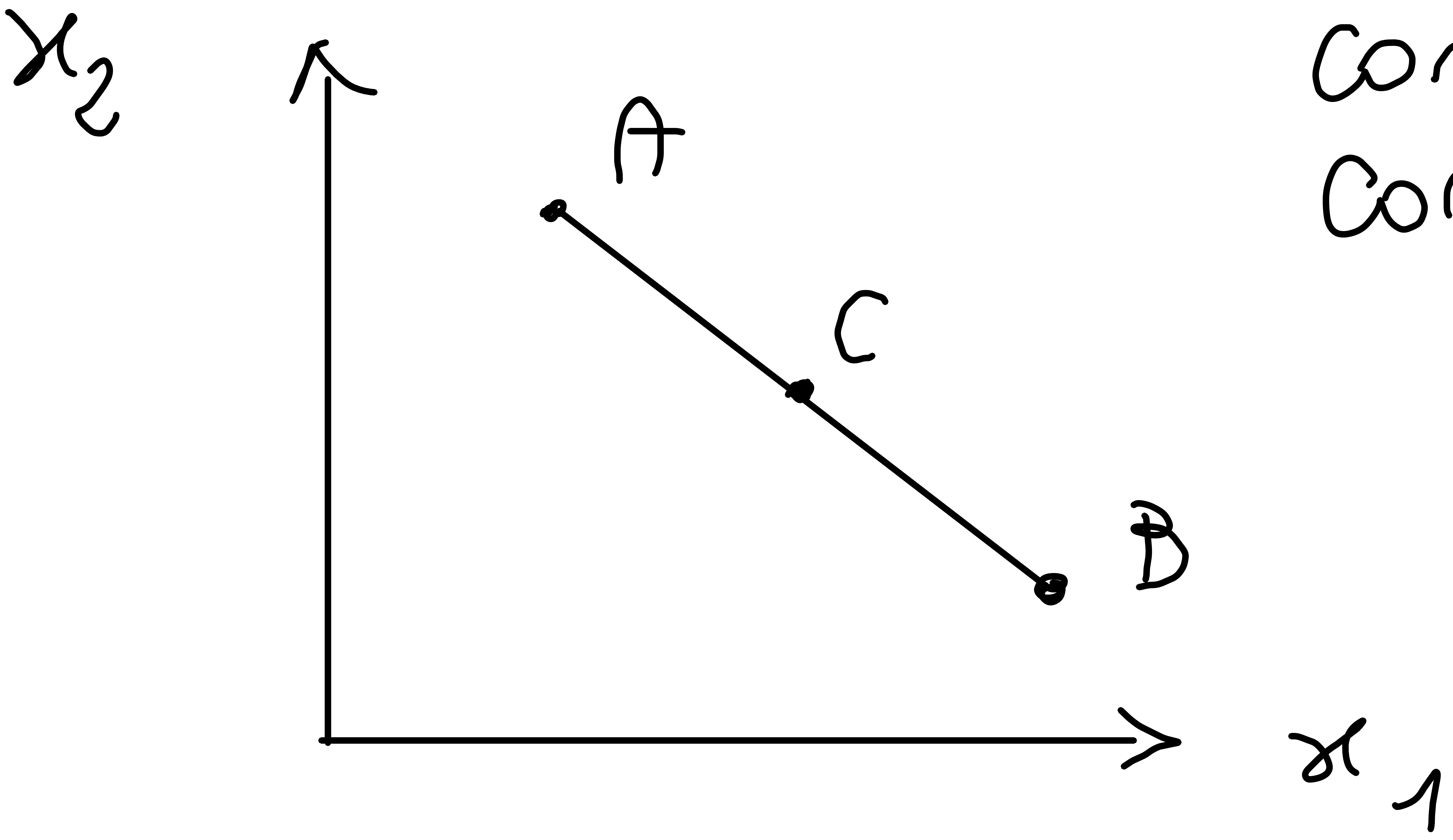


$X \succ Y$

Pref. are
monotonic
continuous
transitive

if indifference curves cross there is a violation of transitivity

↳ indifference curves do not cross



convex combination

$$C = \frac{1}{2}A + \frac{1}{2}B$$

$$C = \frac{1}{2}A + \left(1 - \frac{1}{2}\right)B$$

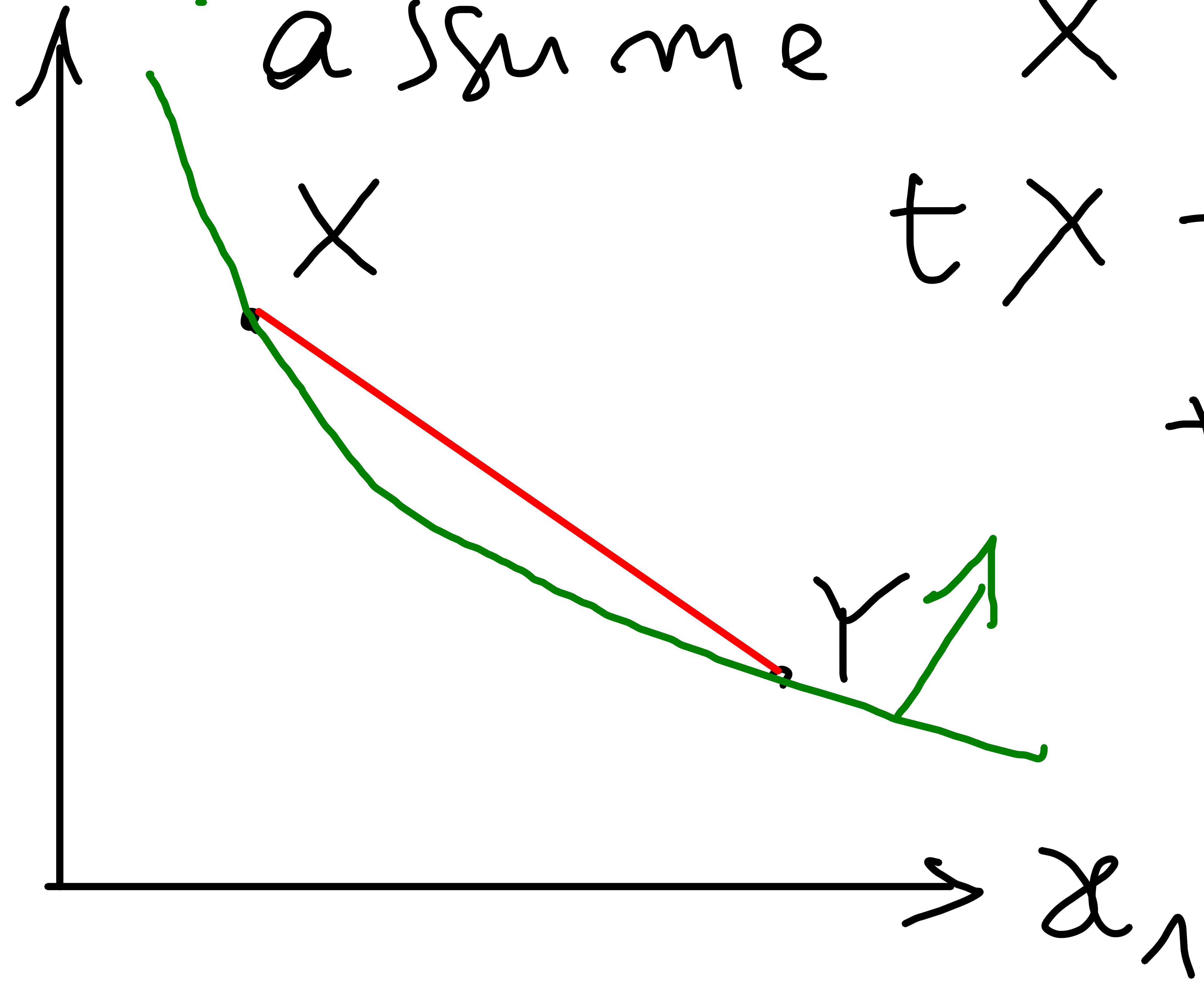
general convex combination $X = tA + (1-t)B \quad 0 \le t \le 1$

Convex preferences

assume $X \sim Y$ then:

$$tX + (1-t)Y \succsim Y \sim X$$

$$\forall t \quad 0 \leq t \leq 1$$

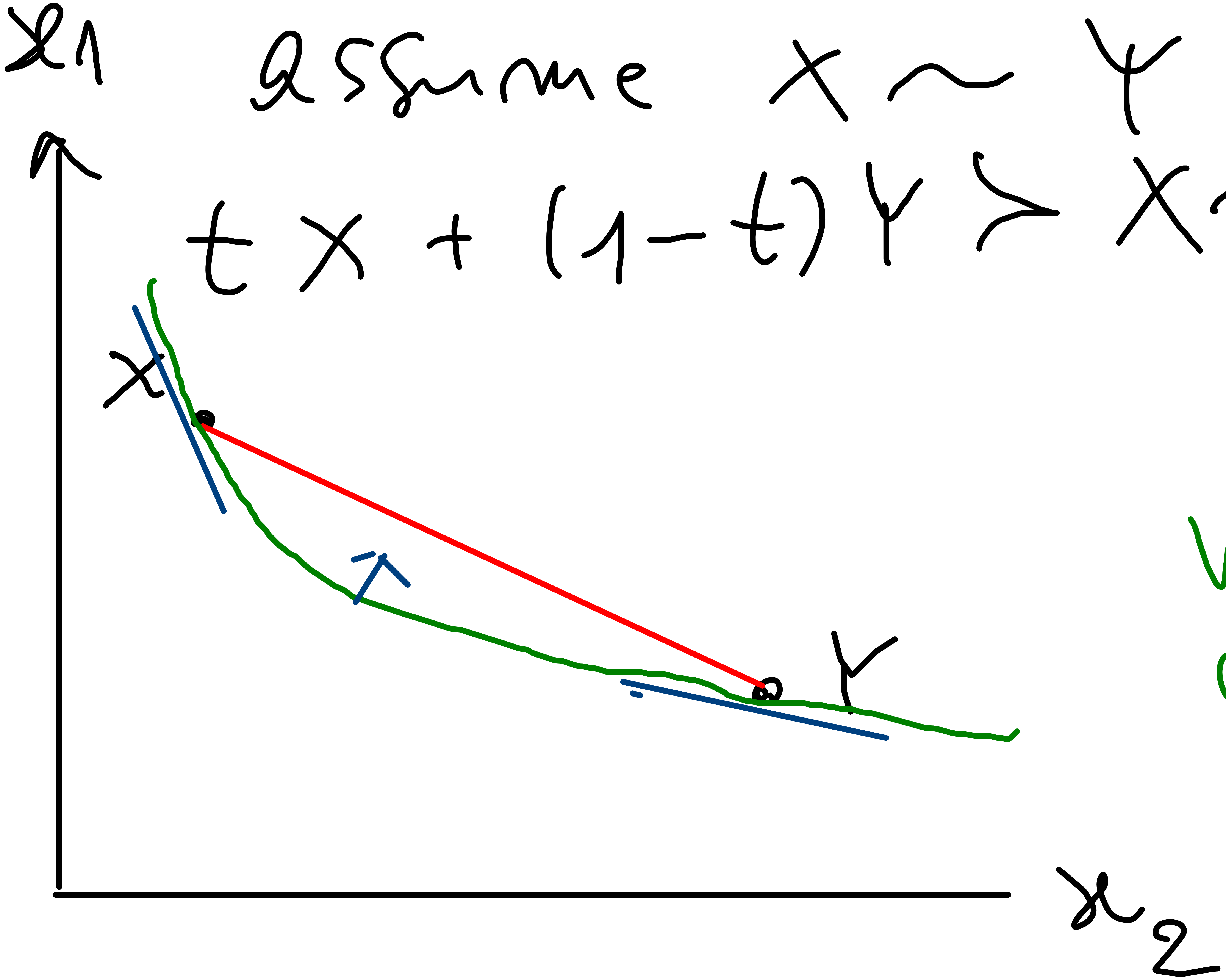


strict convexity

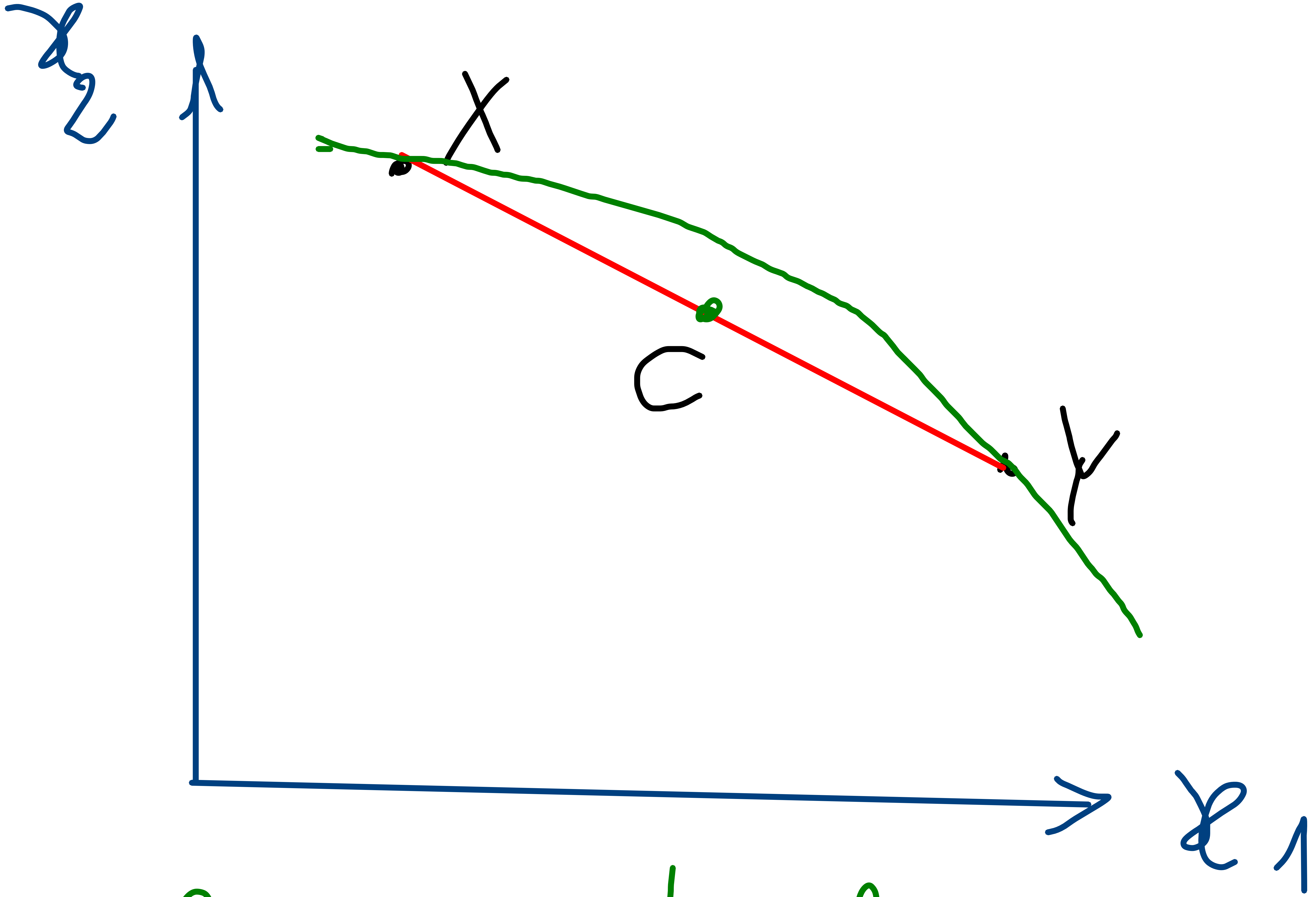
assume $x \sim y$

$tx + (1-t)y \succ x \sim y$

$\forall t \quad 0 < t < 1$

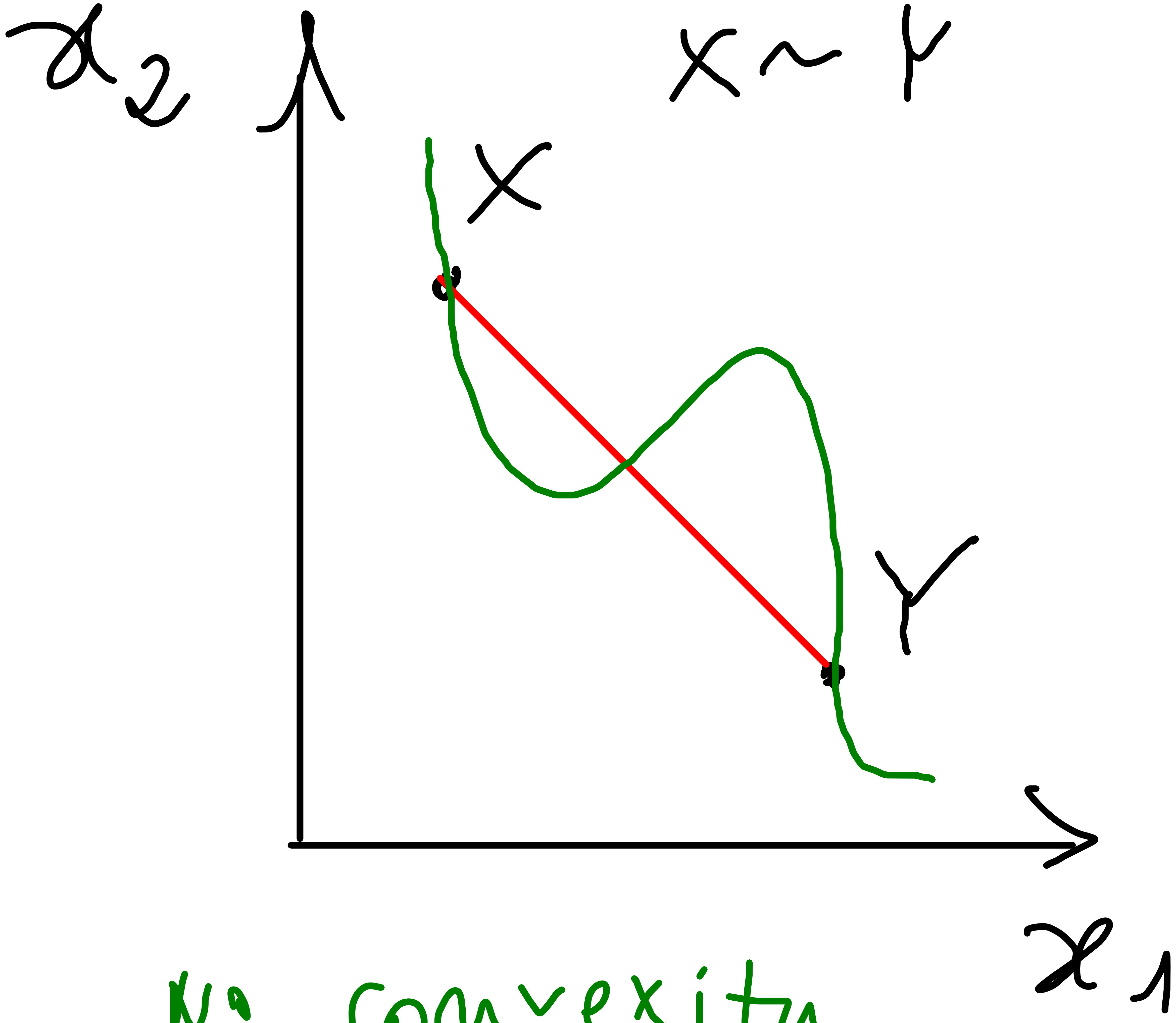


with stric convexity indifference curves are strictly convex.

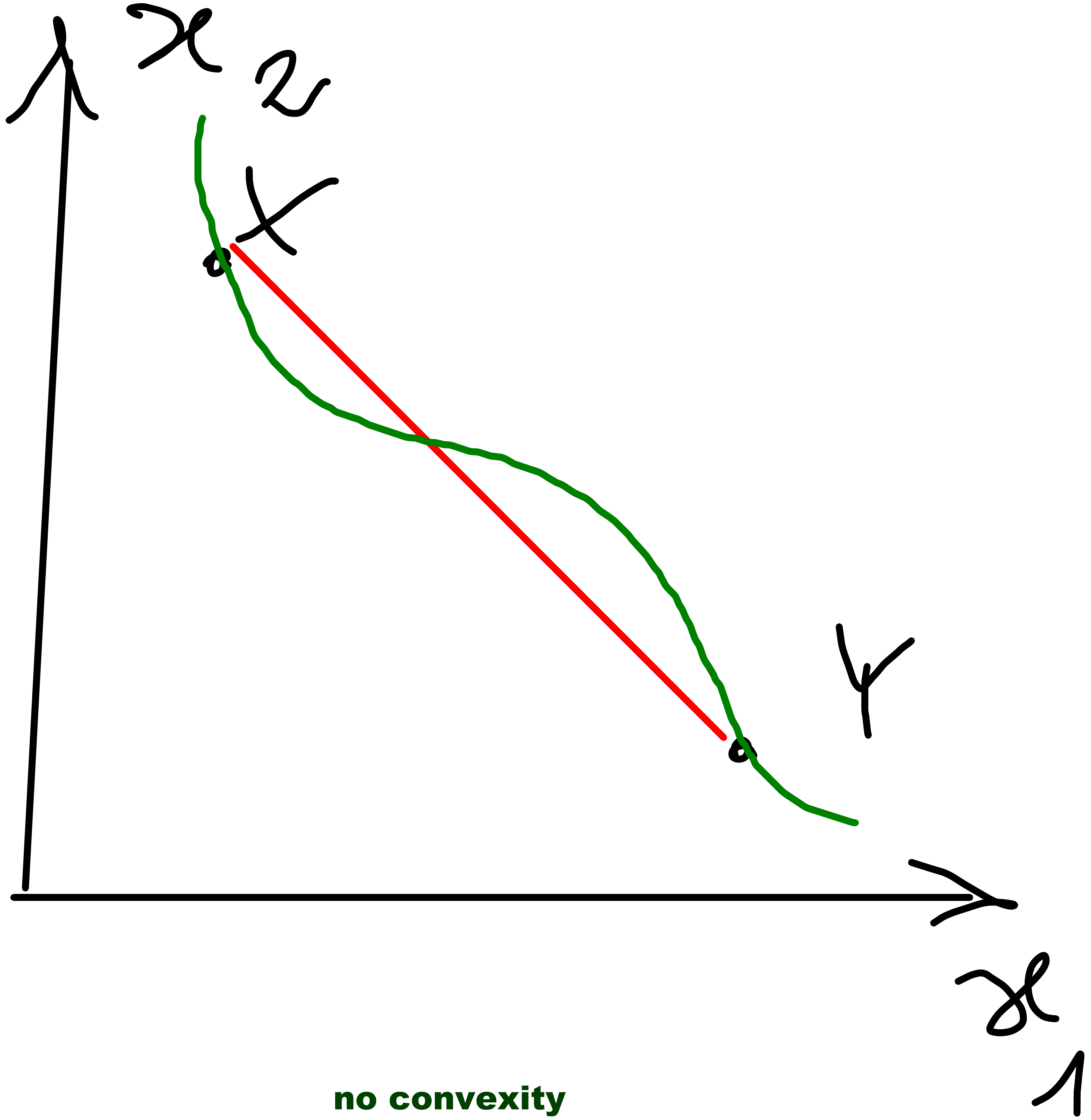


Concave preferences

extreme bundles are preferred to 'averages'



No convexity
No concavity
No monotonicity

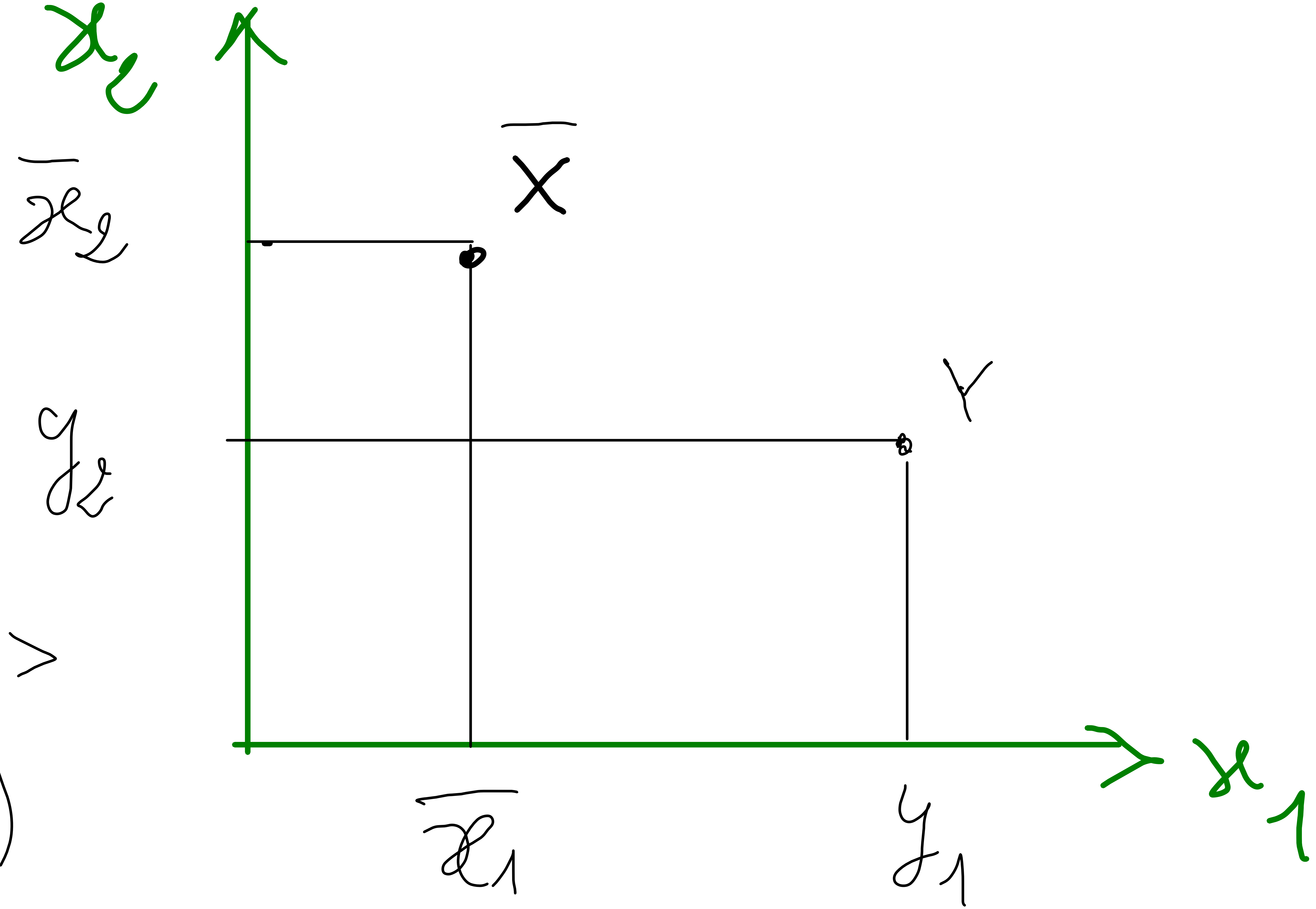


no convexity
no concavity

function $u(x_1, x_2)$ is a utility function representing a preference order

if and only if

$\bar{X} \succ Y \iff u(\bar{x}_1, \bar{x}_2) > u(y_1, y_2)$



then $u(x_1, x_2)$ represents the preference order suppose

$u(x_1, x_2)$ represents $\succsim$

take (x_1, x_2) (y_1, y_2)

either $u(x_1, x_2) > u(y_1, y_2)$

or $u(x_1, x_2) < u(y_1, y_2)$

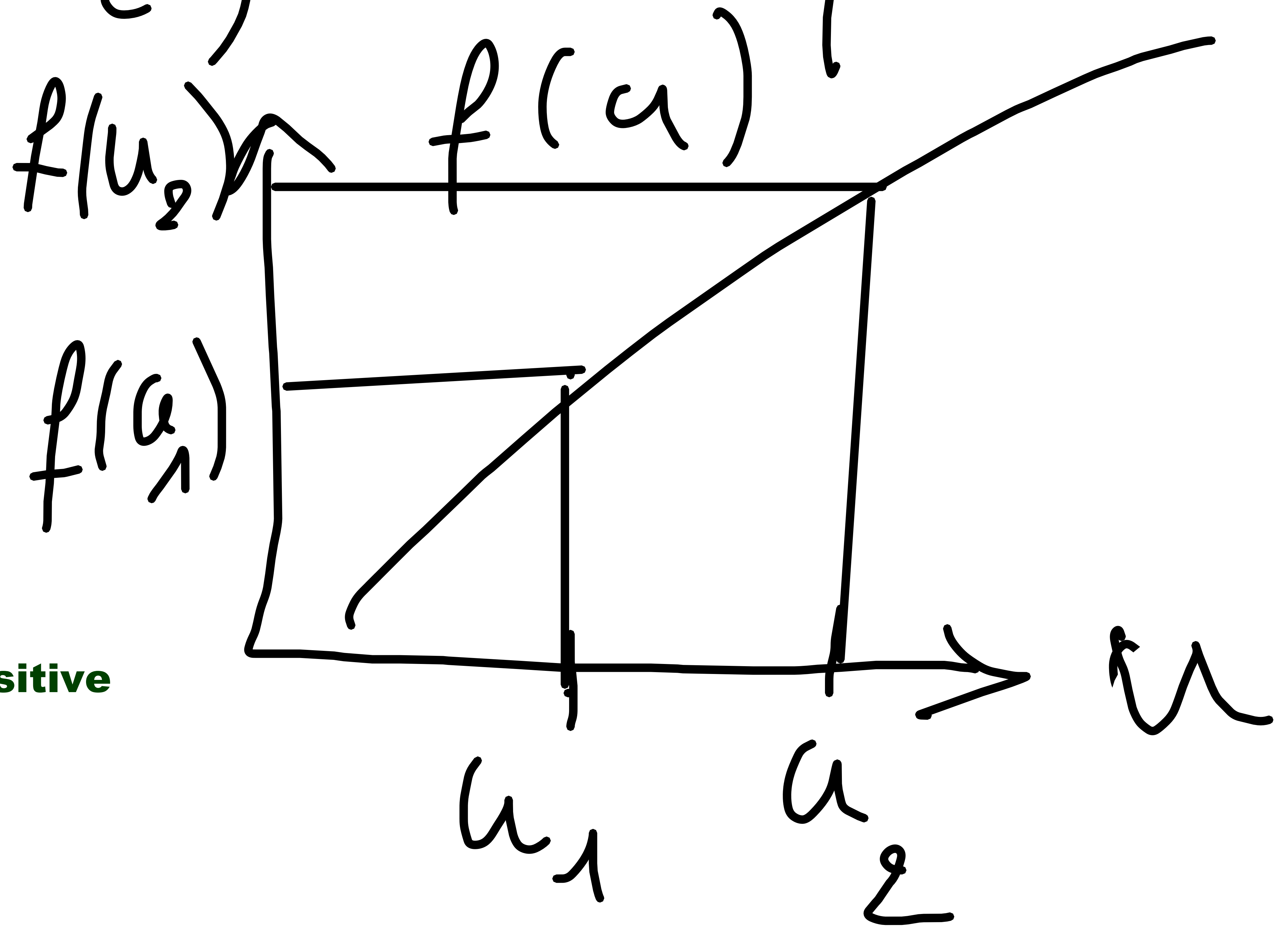
or $u(x_1, x_2) = u(y_1, y_2)$

this implies that the preference order is complete. Similar argument applies for transitivity. We can conclude that a preference order can be represented by a utility function only if it is complete and transitive.

suppose $u(x_1, x_2)$ represents $\succsim$

is $u(x_1, x_2)$ unique? **NO!!**

$f(u)$ $\quad f'(u) > 0$



Remark: and increasing transformation (also called positive monotonic transformation) preserves ORDER.
This implies that if f(u) is an increasing function, then f(u(x1,x2)) is a utility function representing the same preferences represented by u(x1,x2).

Proof: Because u(x1,x2) ia a utility function representing the given preference order and f(u) is increasing:

$$(x_1, x_2) \succ (y_1, y_2) \iff$$

$$u(x_1, x_2) > u(y_1, y_2) \iff$$

$$f(u(x_1, x_2)) > f(u(y_1, y_2))$$

$$\iff V(x_1, x_2) = f(u(x_1, x_2))$$

V(x1, x2) is another utility function representing the same preferences.