Work, wellbeing, and scarcity

Sessions 5–6

PMAP 8141: Microeconomics for Public Policy
Andrew Young School of Policy Studies

Plan for today

Incentives

Elasticity

Preferences, constraints, and tradeoffs

Utility and indifference

Calculus party!!!

Maximizing utility

Incentives

Why do people do what they do?

People get utility from doing stuff

Extrinsic rewards

Intrinsic rewards

These can get distorted and crowded out!

Why care as an MPA/MPP?

Good policy uses incentives to channel behavior toward some desired outcome. Bad policy either ignores incentives or fails to anticipate how rational individuals might change their behavior to avoid being penalized.

Naked Economics, p. 39

Perverse incentives

U.S. Department of Education

No Child
LEFT BEHIND

Importance of incentives

People respond to what you signal

You get what you measure

Daycares and late pickups

Blood donors

Taxes

Favors

Thanksgiving

Playgroups and daycares

MLMs

NED and democracy promotion

Extrinsic rewards can crowd out intrinsic motivations

Don’t violate important social relationships by reducing services to a market transaction

Pay enough or don’t pay at all

Elasticity

Elasticity

How responsive people are to changes in prices

"If the price changes, how much does the quantity change?"

Elasticity and responsiveness

$$\varepsilon = -\frac{\%\text{ change in demand}}{\%\text{ change in price}} \qquad \varepsilon = -\frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

% change in demand that follows a 1% change in price

Q ↑ P ↓
or
Q ↓ P ↑

ϵ = 2: ”If price increases by 10%, quantity decreases by 20%”

ϵ = 0.5: ”If price increases by 10%, quantity decreases by 5%”

$\epsilon = \infty$ = Perfectly elastic

Any change in price moves quantity to 0

Identical goods
Two vending machines

$\epsilon > 1$ = Elastic

Changes in price change the quantity a lot

Goods with substitutes
Diet Coke

$\epsilon = 1$ = Unit elastic

Changes in price change the quantity the same

$\epsilon < 1$ = Inelastic

Changes in price change the quantity a little

Goods with few substitutes
AIDS medicine

$\epsilon = 0$ = Perfectly inelastic

Changes in price do nothing to the quantity

Survival goods
Water in the desert

ϵ, taxes, and preferences

Taxing things changes their prices

Changing prices changes quantities demanded

Taxing elastic goods will make quantities go down a lot and decrease tax revenues

Taxing inelastic goods will make quantities go down slightly and not hurt revenues

Category	Type	Calories per serving	Price per 100 g ($)	Typical spending per week ($)	Price elasticity of demand
1	Fruit and vegetables	660	0.38	2.00	1.128
2	Fruit and vegetables	140	0.36	3.44	0.830
15	Grain, pasta, bread	1,540	0.38	2.96	0.854
17	Grain, pasta, bread	960	0.53	2.64	0.292
28	Snacks, candy	433	1.13	4.88	0.270
29	Snacks, candy	1,727	0.68	7.60	0.295
30	Milk	2,052	0.09	2.32	1.1793
31	Milk	874	0.15	1.44	1.972

If P↑ by 10%, Q↓ ...

8.3%

2.7%

19.72%

General tax guidance

Tax inelastic products unless you're tying to change consumption

Soda?

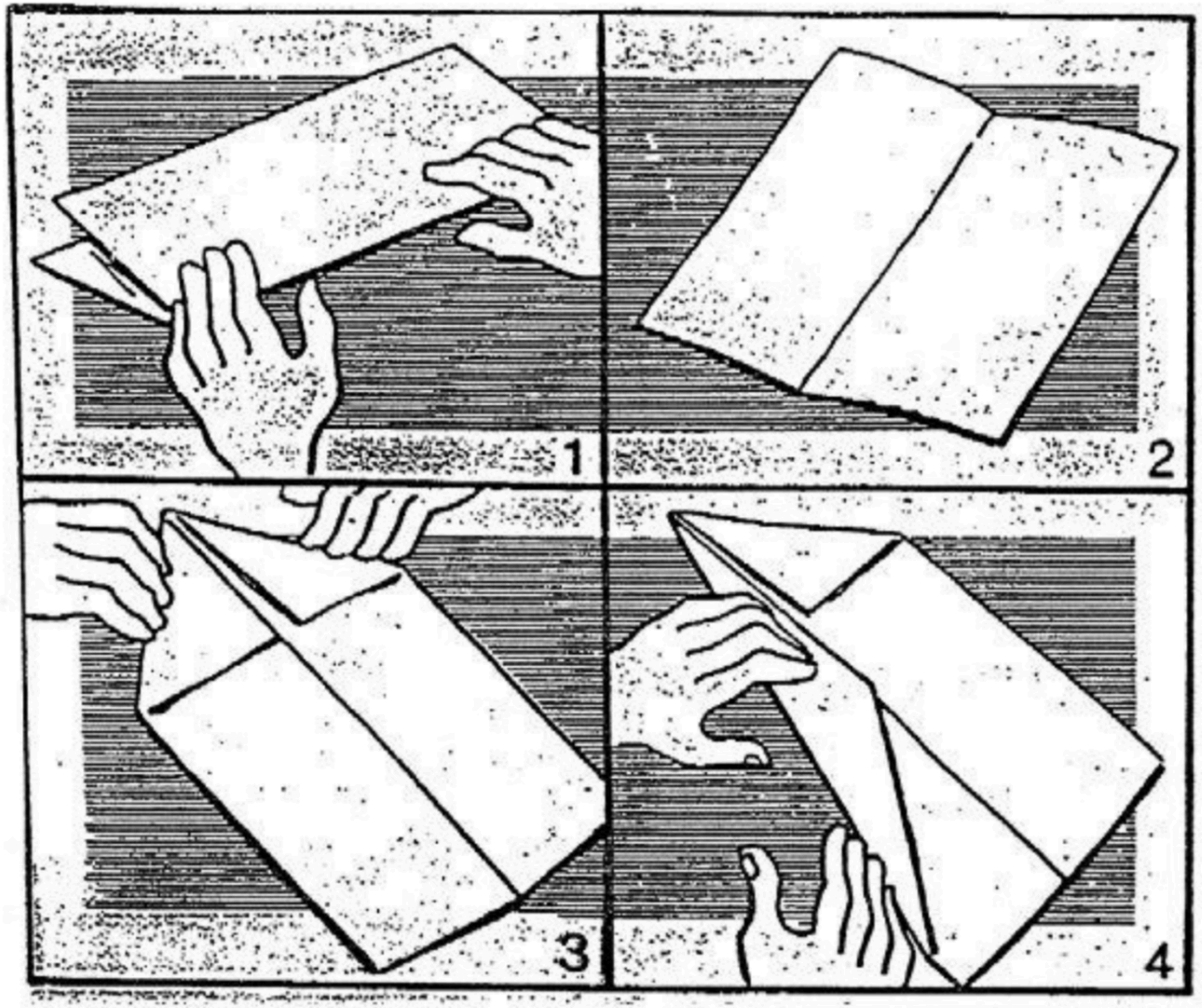
Cigarettes?

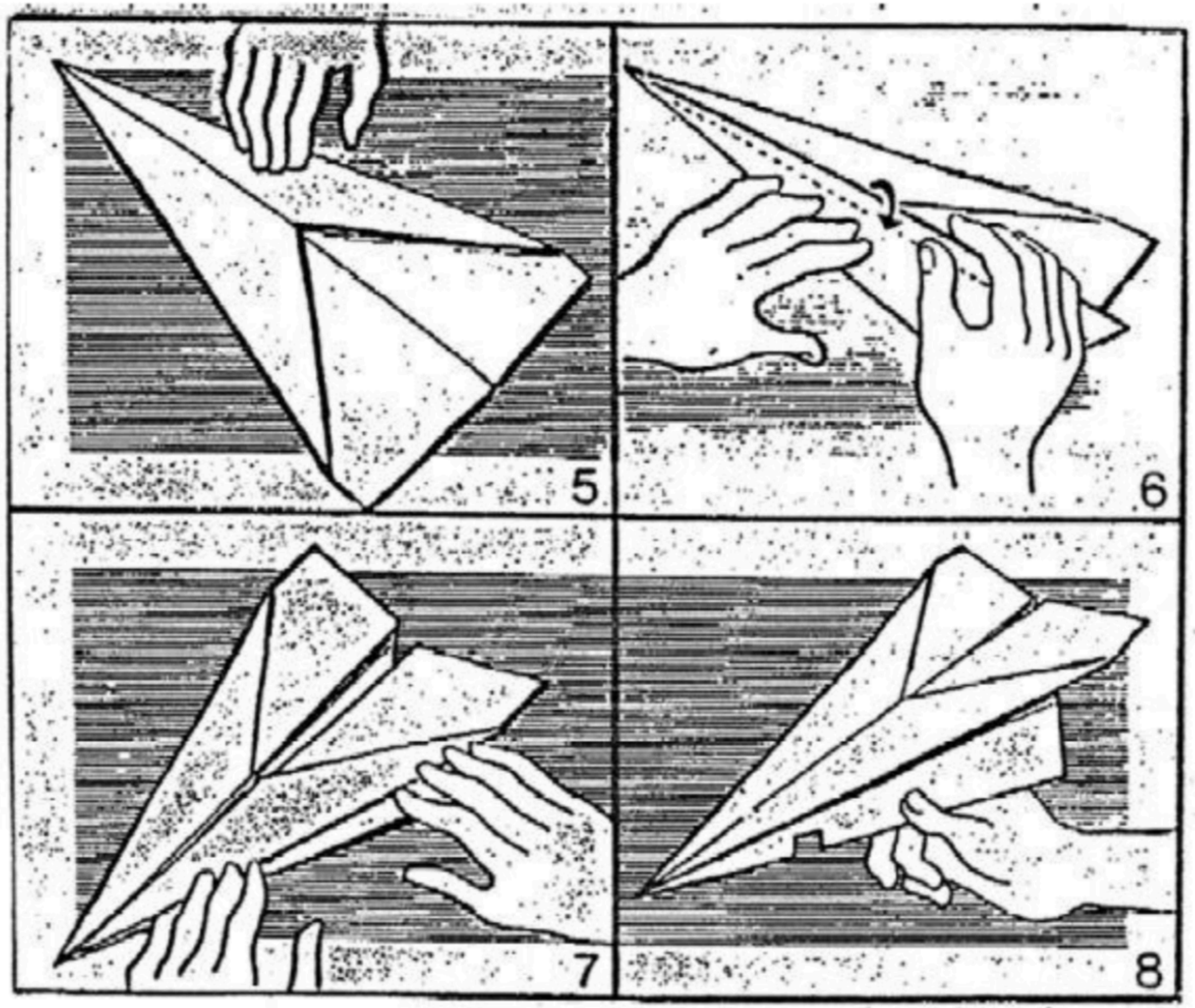
Alcohol?

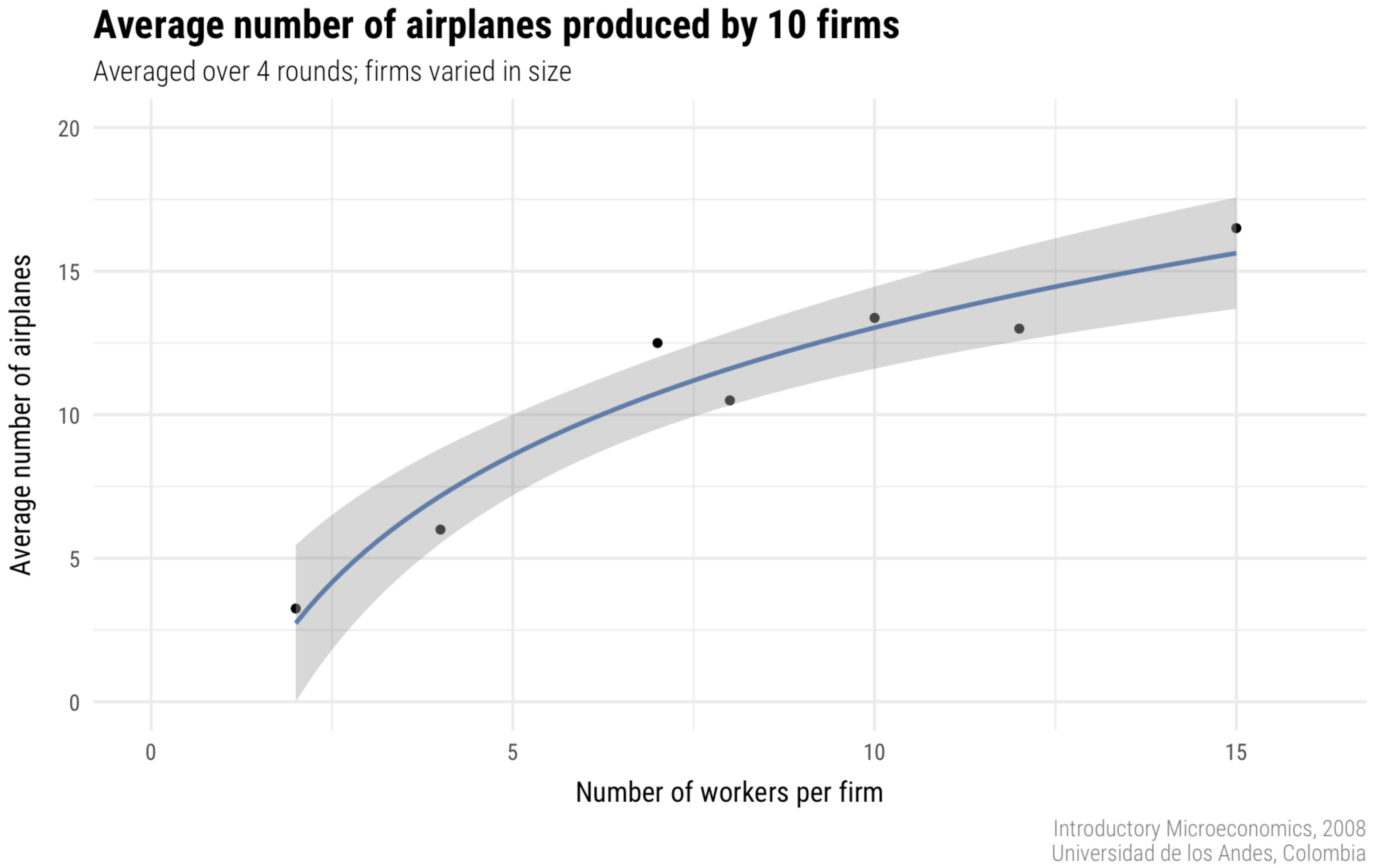
Property?

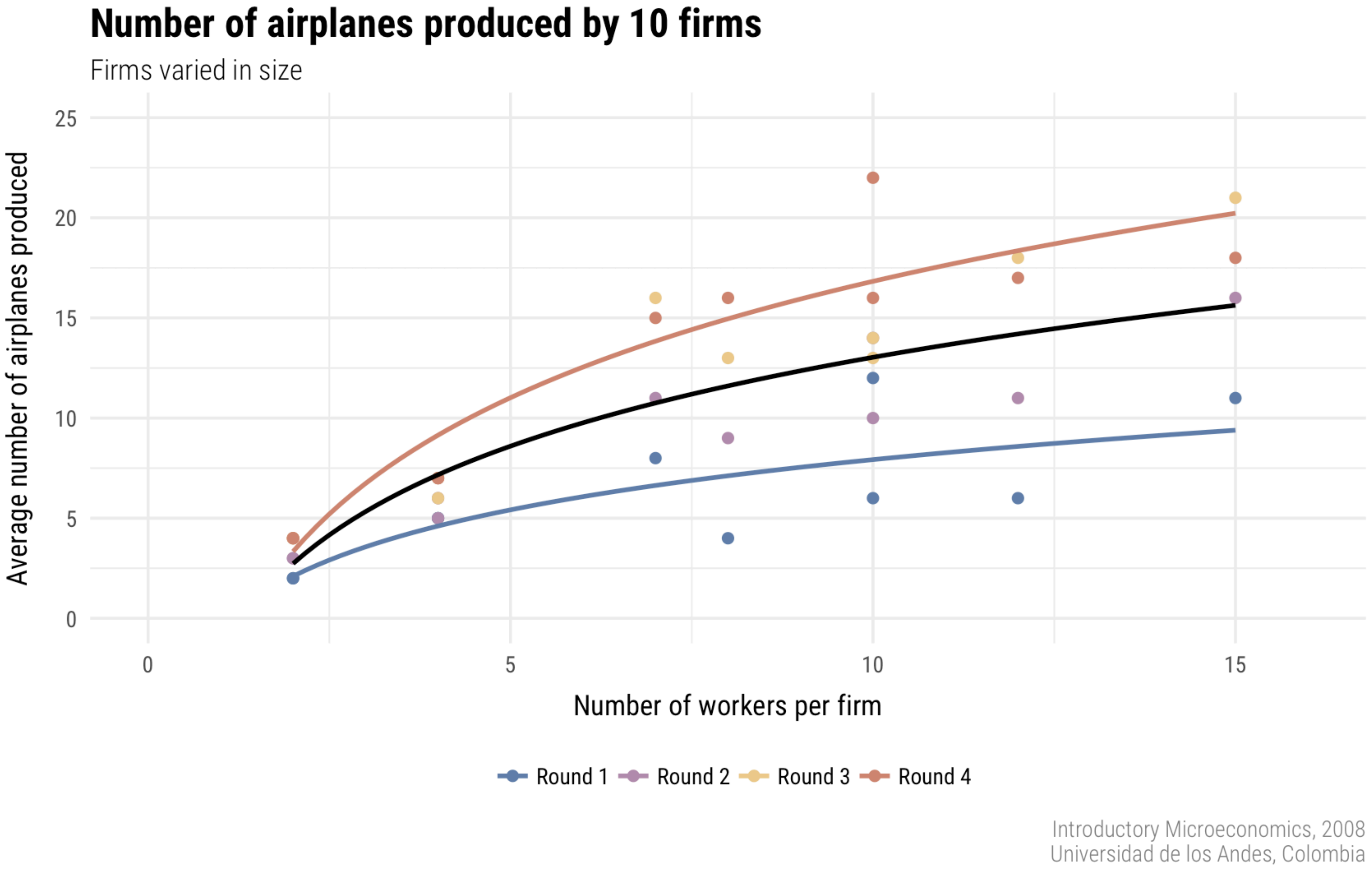
Those who can afford to avoid taxes will try to avoid them

Preferences, constraints, and tradeoffs

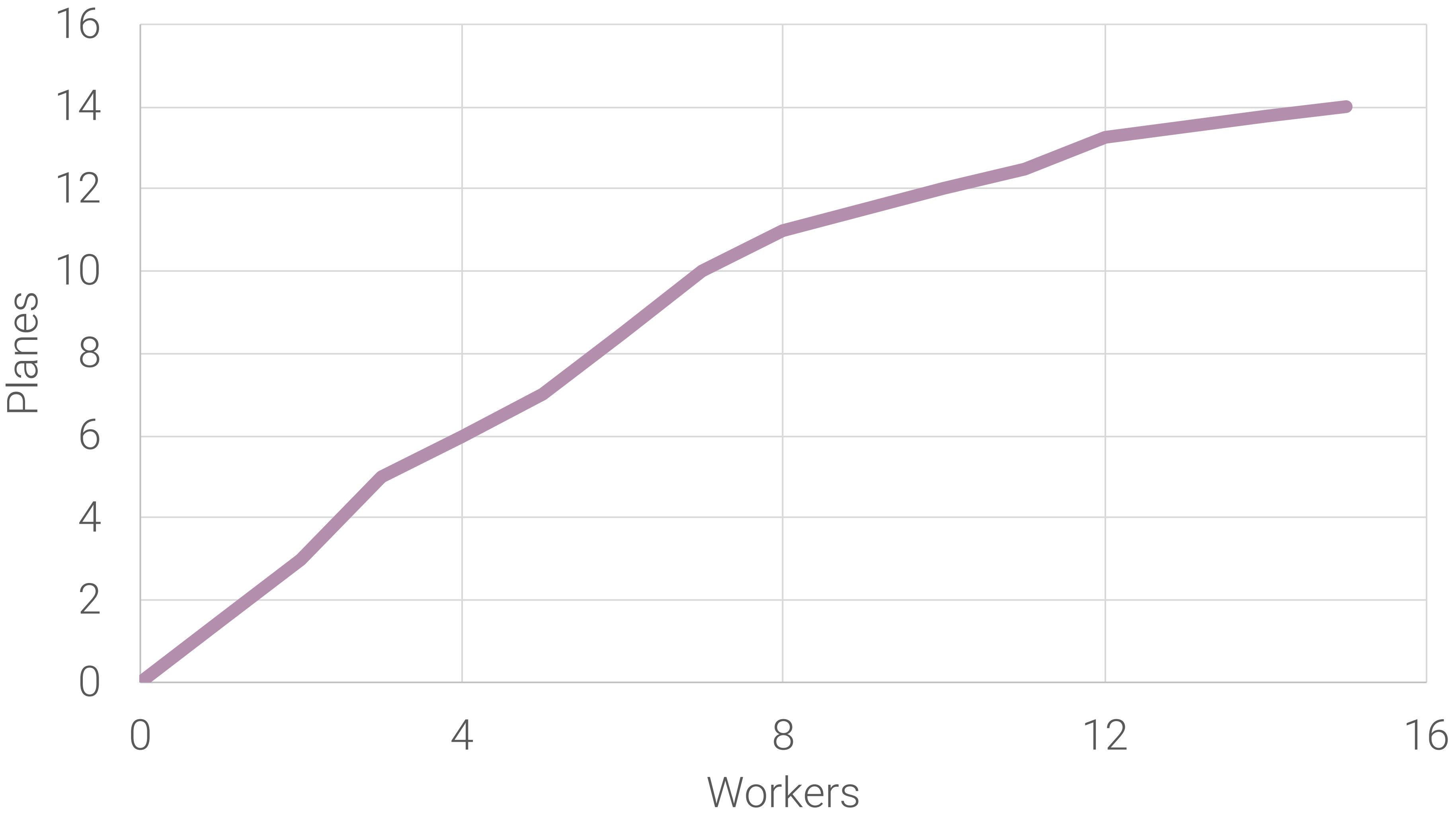

1
2
3
4


5
6
7
8


Average number of airplanes produced by 10 firms
Averaged over 4 rounds; firms varied in size
Average number of airplanes
0
5
10
15
20
Number of workers per firm
0
5
10
15
Introductory Microeconomics, 2008
Universidad de los Andes, Colombia



Number of airplanes produced by 10 firms
Firms varied in size
Average number of airplanes produced
25
20
15
10
5
0
0
5
10
15
Number of workers per firm
Round 1
Round 2
Round 3
Round 4
Introductory Microeconomics, 2008
Universidad de los Andes, Colombia



Average product

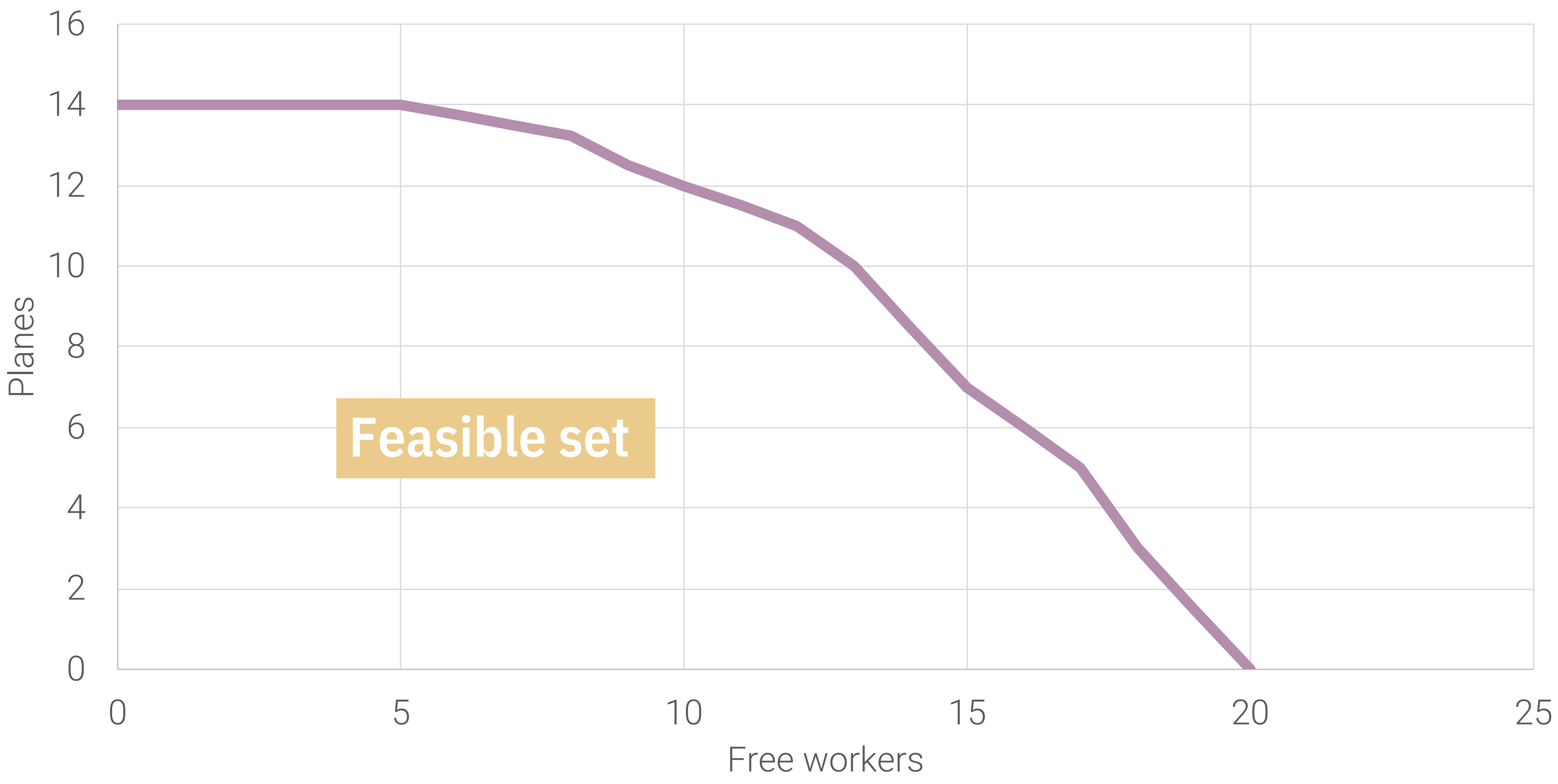
Planes per worker

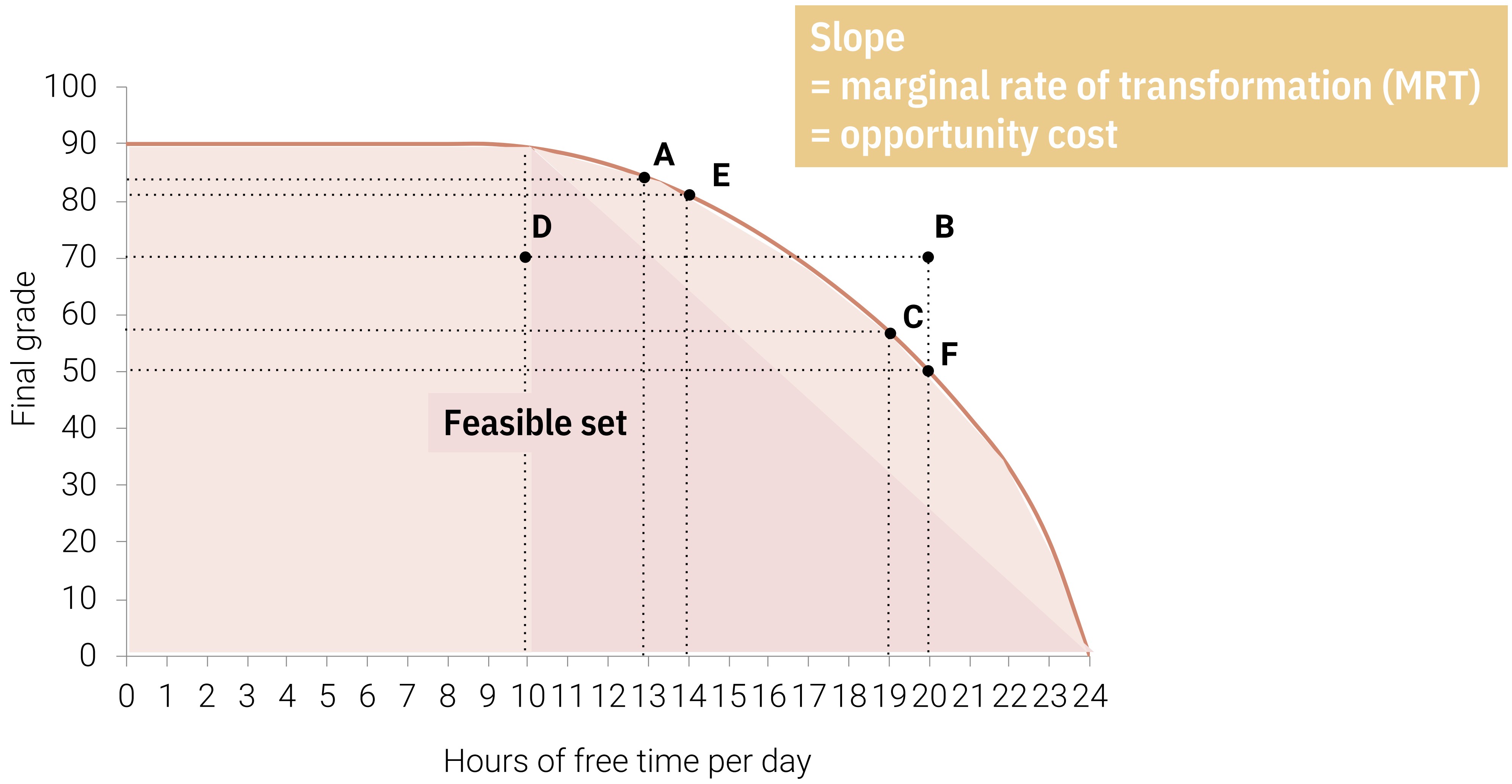
Marginal product

Planes per *additional* worker

Workers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Planes	0	1.5	3	5	6	7	8.5	10	11	11.5	12	12.5	13.25	13.5	13.75	14

Does marginal product always diminish?


16
14
12
10
8
6
4
2
0
Planes
Feasible set
0
5
10
15
20
25
Free workers



	A	E	C	F
Free time	**13**	**14**	**19**	**20**
Grade	**84**	**81**	**57**	**50**
Opportunity cost	**3**		**7**	

IF YOU SPEND NINE MINUTES OF YOUR TIME TO SAVE A DOLLAR, YOU'RE WORKING FOR LESS THAN MINIMUM WAGE.

Opportunity cost

The value of the thing you can’t do because of a decision

The value of the forgone option


WIGGY WASH
Starting at
$6.95
for first month
EXPRESS DETAI
1
EXIT ONLY

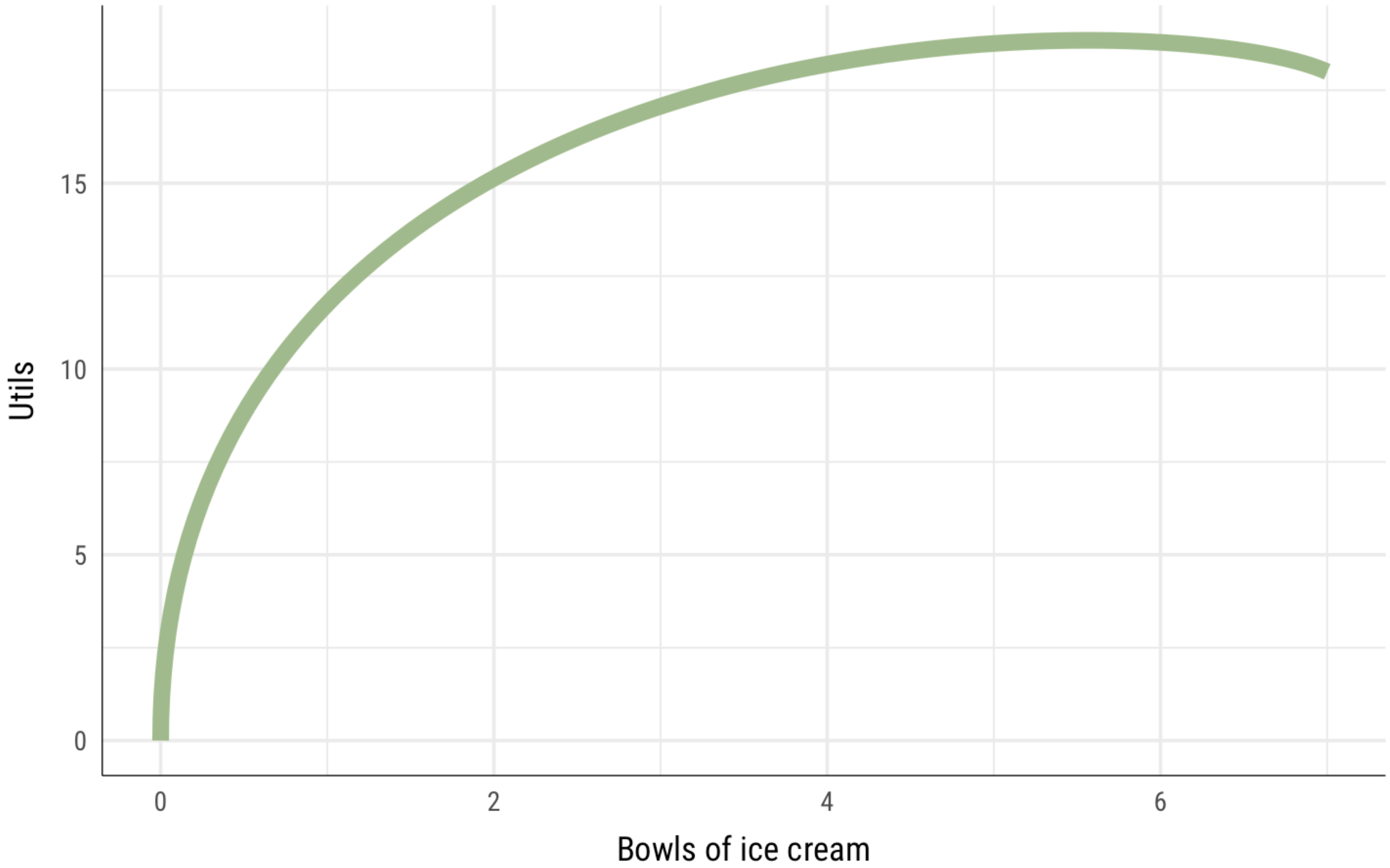
Opportunity cost

Cost for theater concert	$25	
Value of park concert to you	$15	
Economic cost of theater	$40	
Value of theater concert to you	$50	$35
Your choice	Theater	Park

Utility

Happiness points

Diminishing marginal utility



Utility and indifference

Utility bundles

Theoretical combination of goods that provide same level of utility

$$u(x_1, x_2)$$

$$u(x_1, x_2) = x_1 x_2$$

Utility bundles

$$u(x_1, x_2) = x_1 x_2$$

$u(1, 2)$ **2**

$u(100, 3)$ **300**

$u(4, 1)$ **4**

Utility bundles

$$u = xy$$

x and y give same utility

$$u = \sqrt{xy}$$

x and y give same utility

$$u = x^2 y^2$$

x and y give same utility

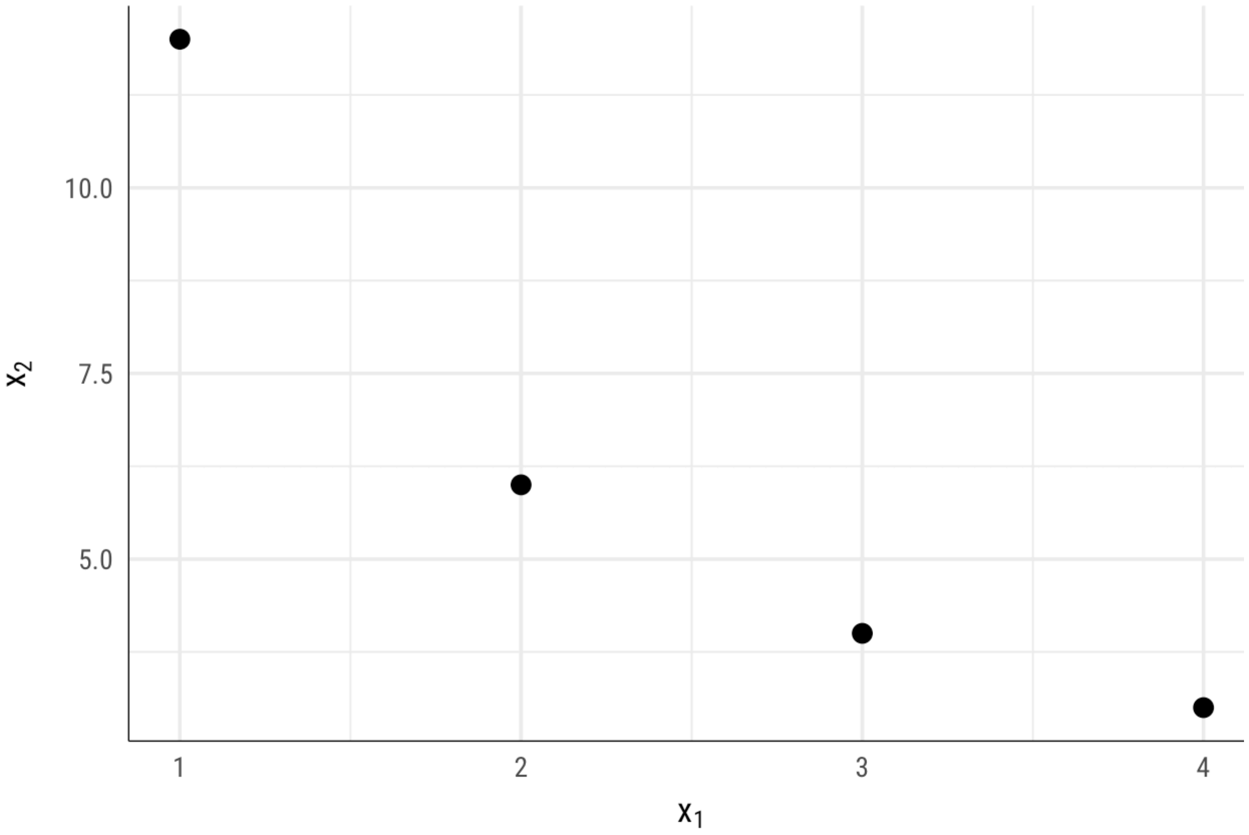
$$u = x^2 y$$

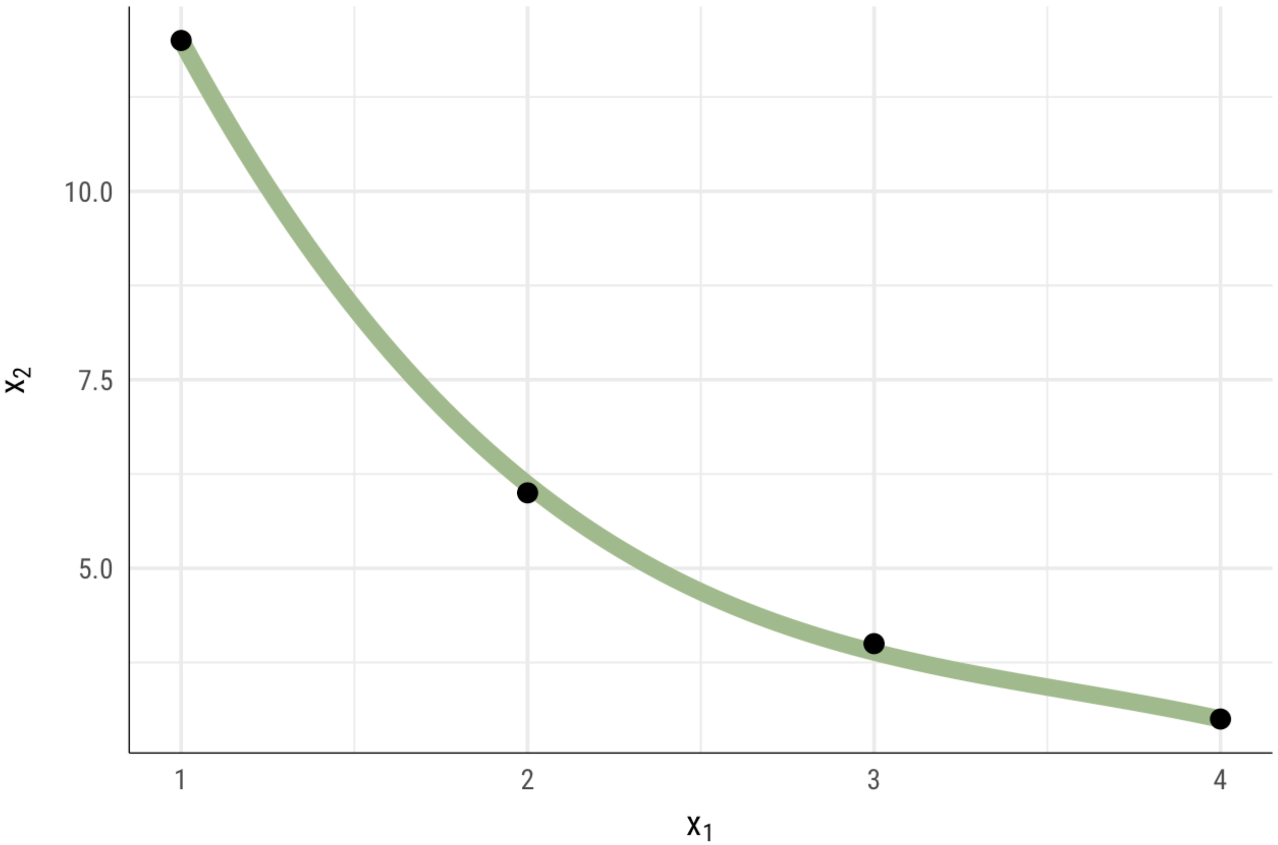
x gives more utility than y

What combinations of inputs will produce 12 utils?

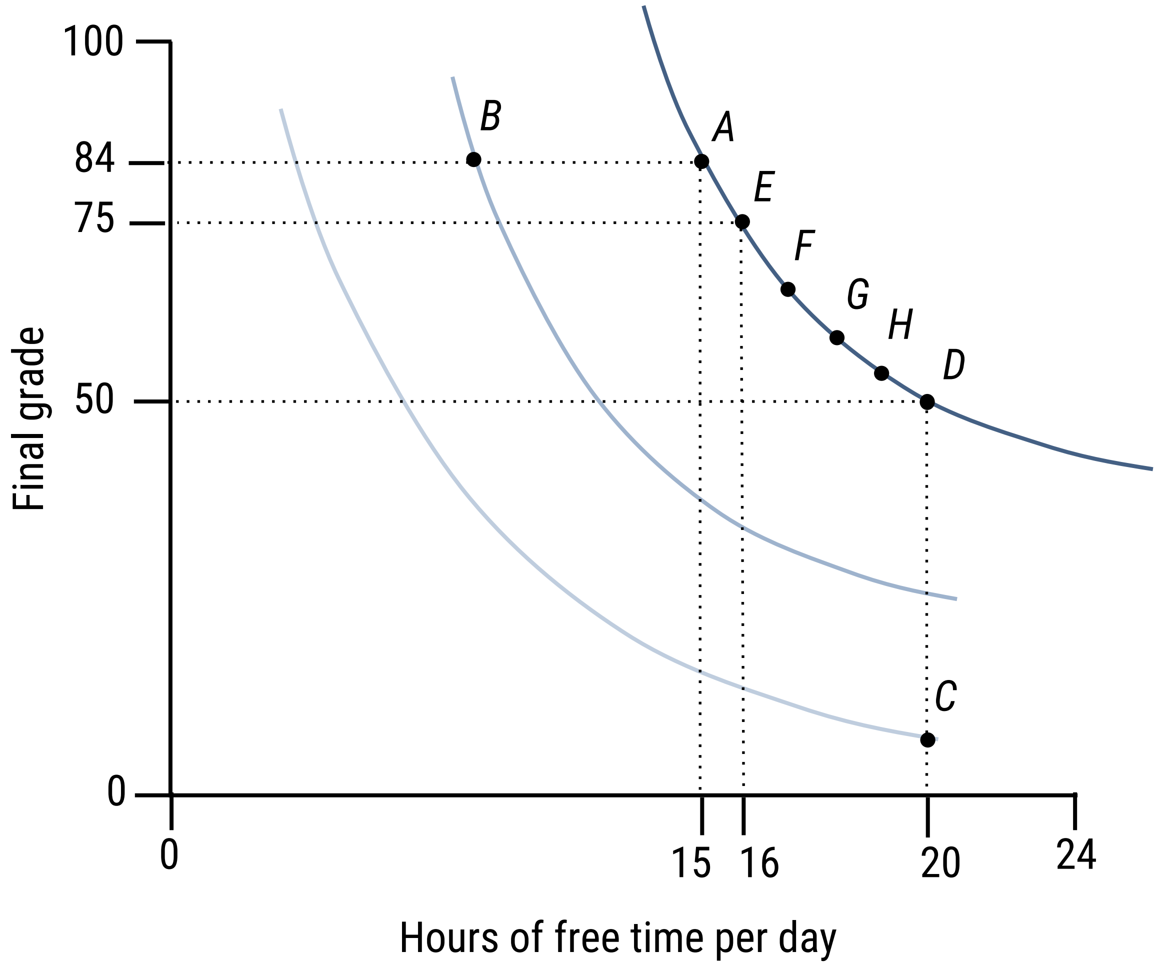
$$u(x_1, x_2) = x_1 x_2$$

$$u(x_1, x_2) = x_1 x_2$$





Indifference curves

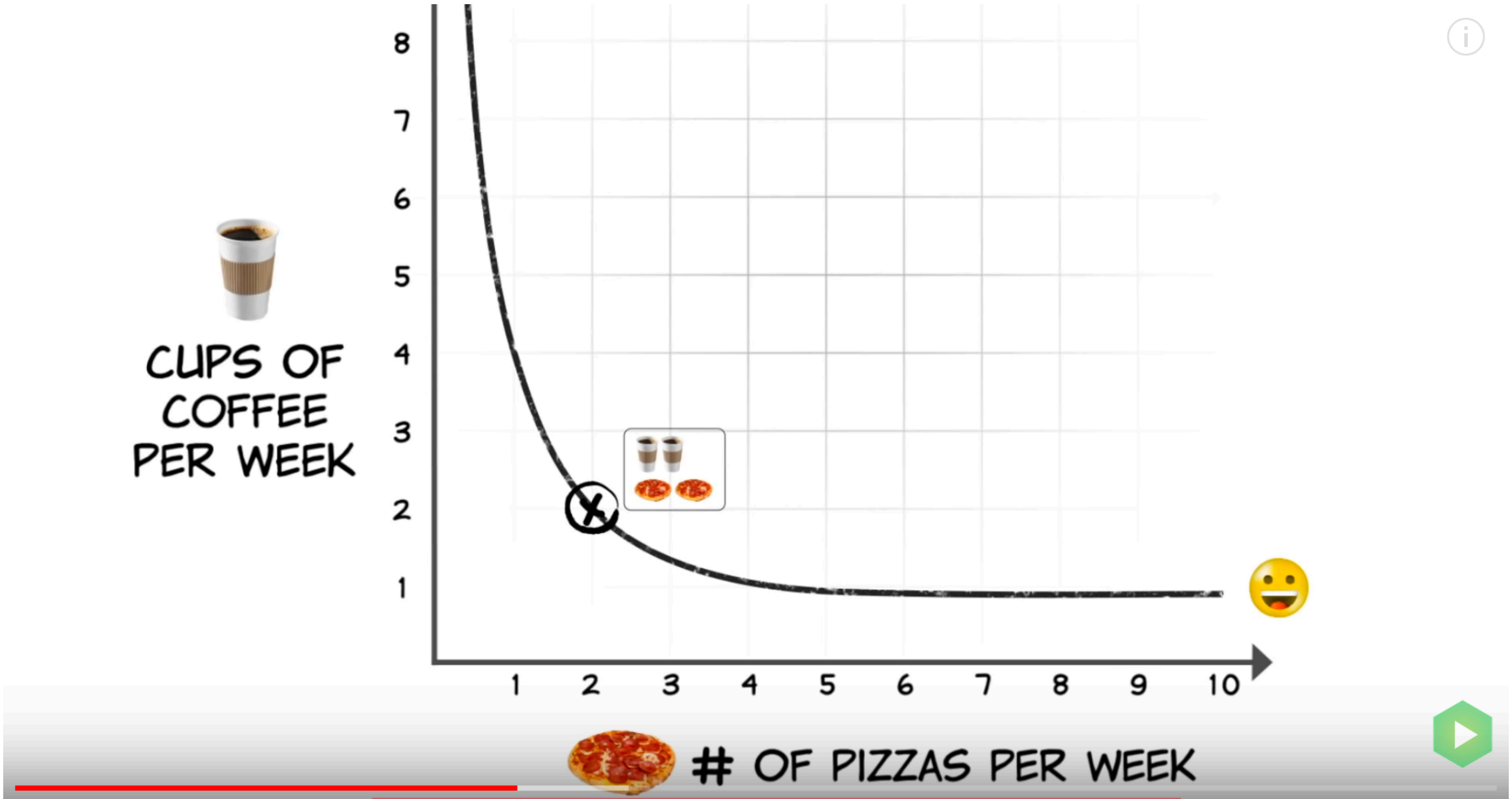


Indifference curves

Theoretical points where we’re equally happy with a mix of goods

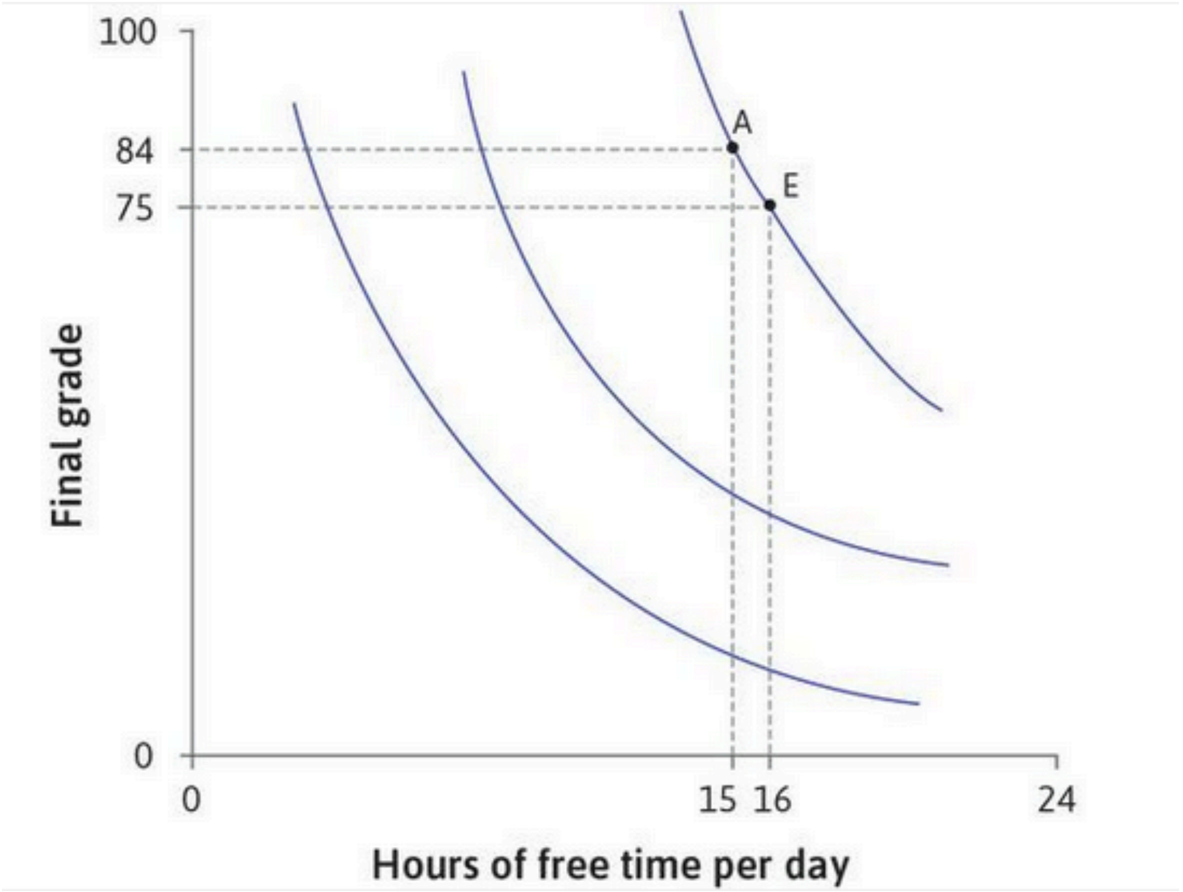
Measured in utility (or “utils”, or happiness points)

Higher curves = more utils

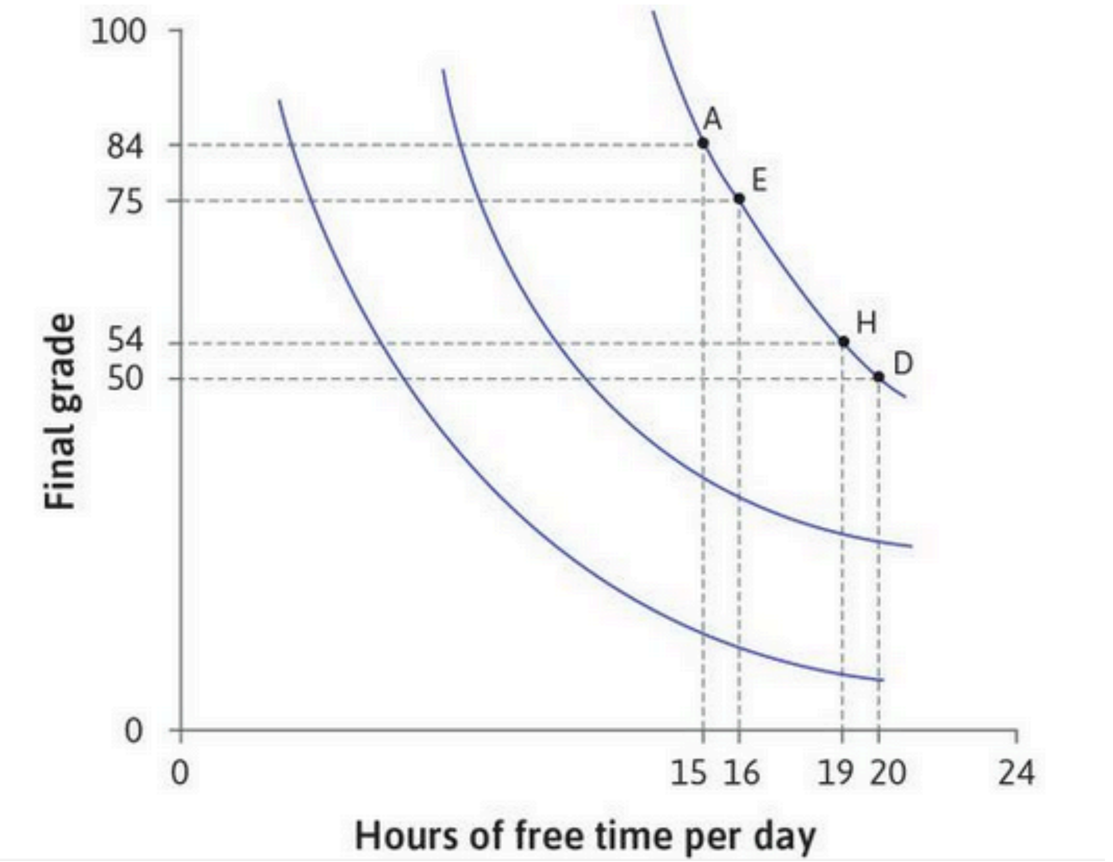


https://www.youtube.com/watch?v=iOmDo5jLFw8

Slope of indifference curve = marginal rate of substitution (MRS)



MRS at A = 9



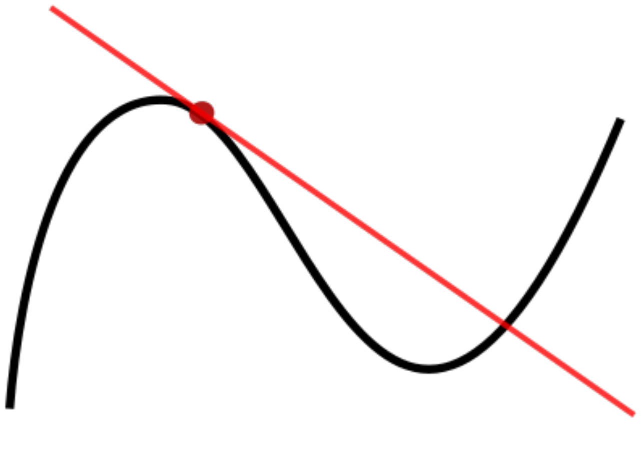
MRS at H = 4

Calculus party!!!

Two reasons for calculus

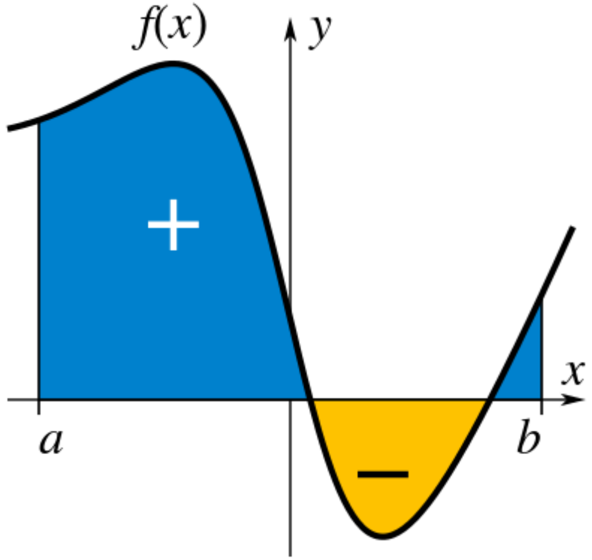
Find the slope of a line

Differential calculus



Find the area under a line

Integral calculus



Drawing lines with math

$$y = mx + b$$

y	A number	
x	A number	
m	Slope	$\frac{rise}{run}$
b	y intercept	

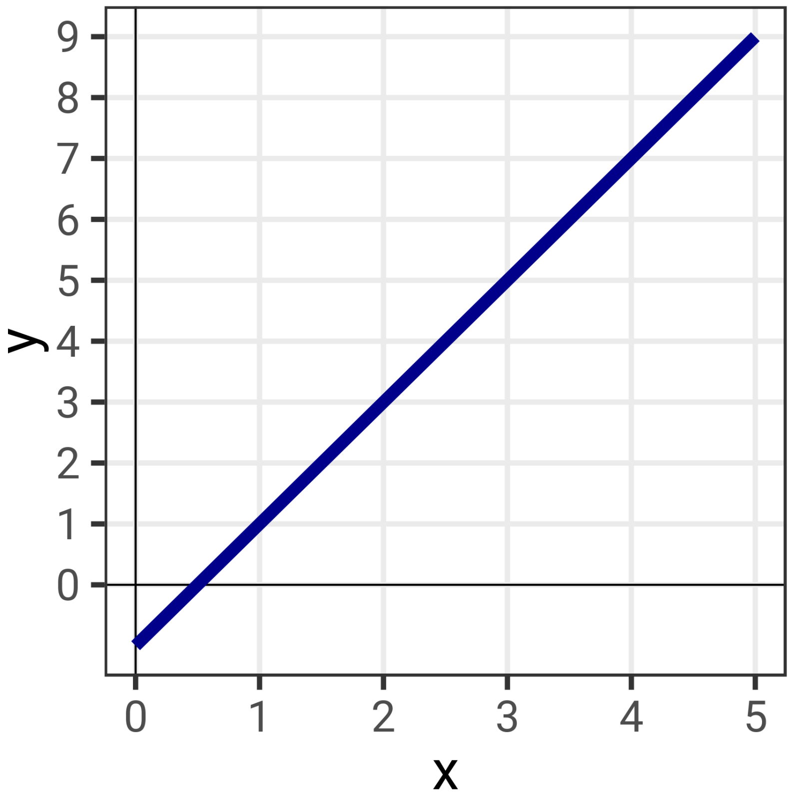
Slope

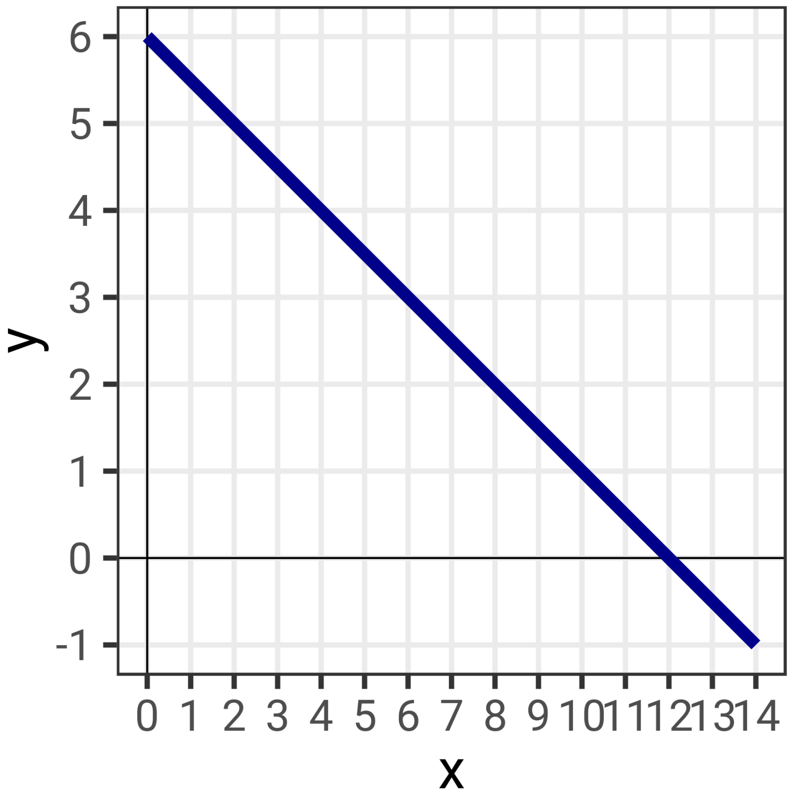
Slope = rise/run =
how y changes
as you change x

Slopes and intercepts

$$y = 2x - 1$$

$$y = -0.5x + 6$$





Graph these

desmos.com

$y = 5x + 2$

$y = x - 1$

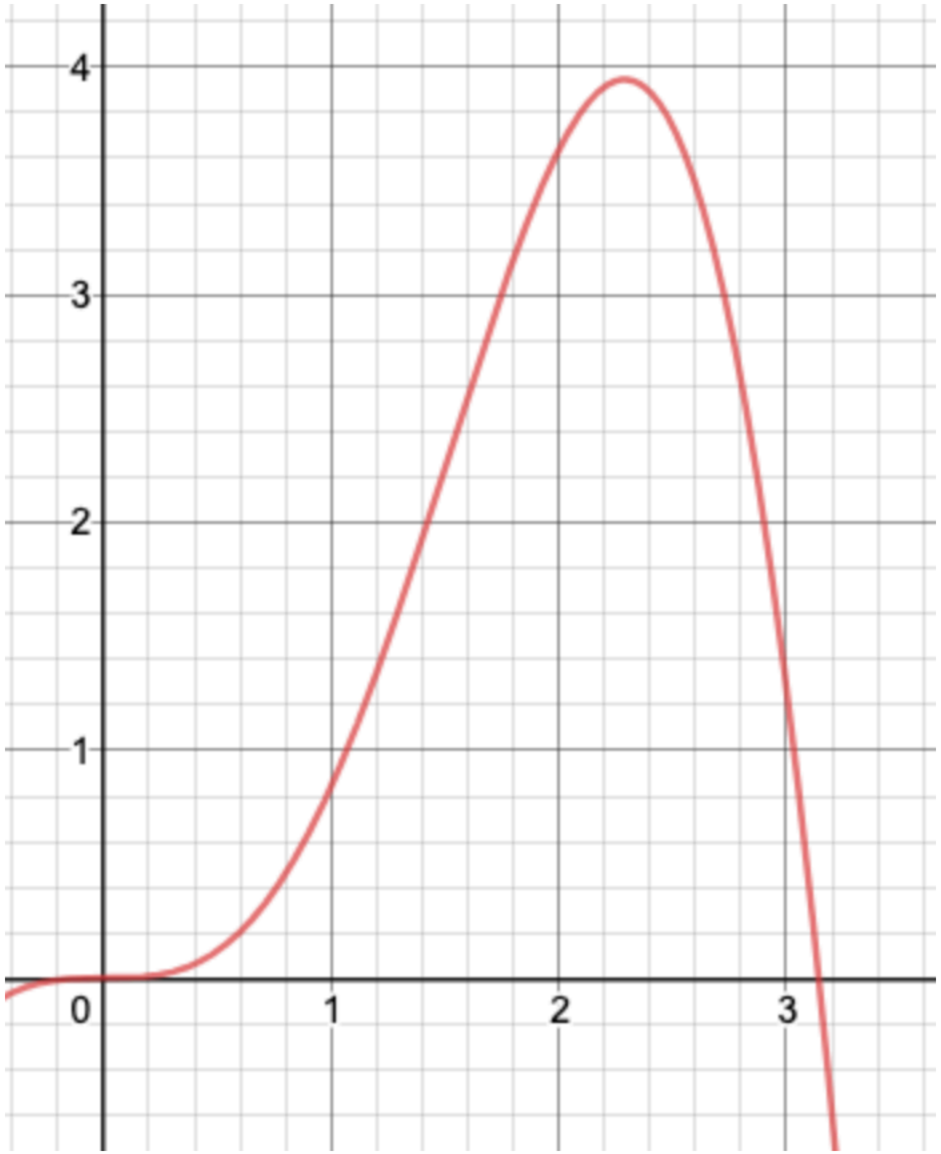
$y = -2x + 11$

$y = 6 - 2x$

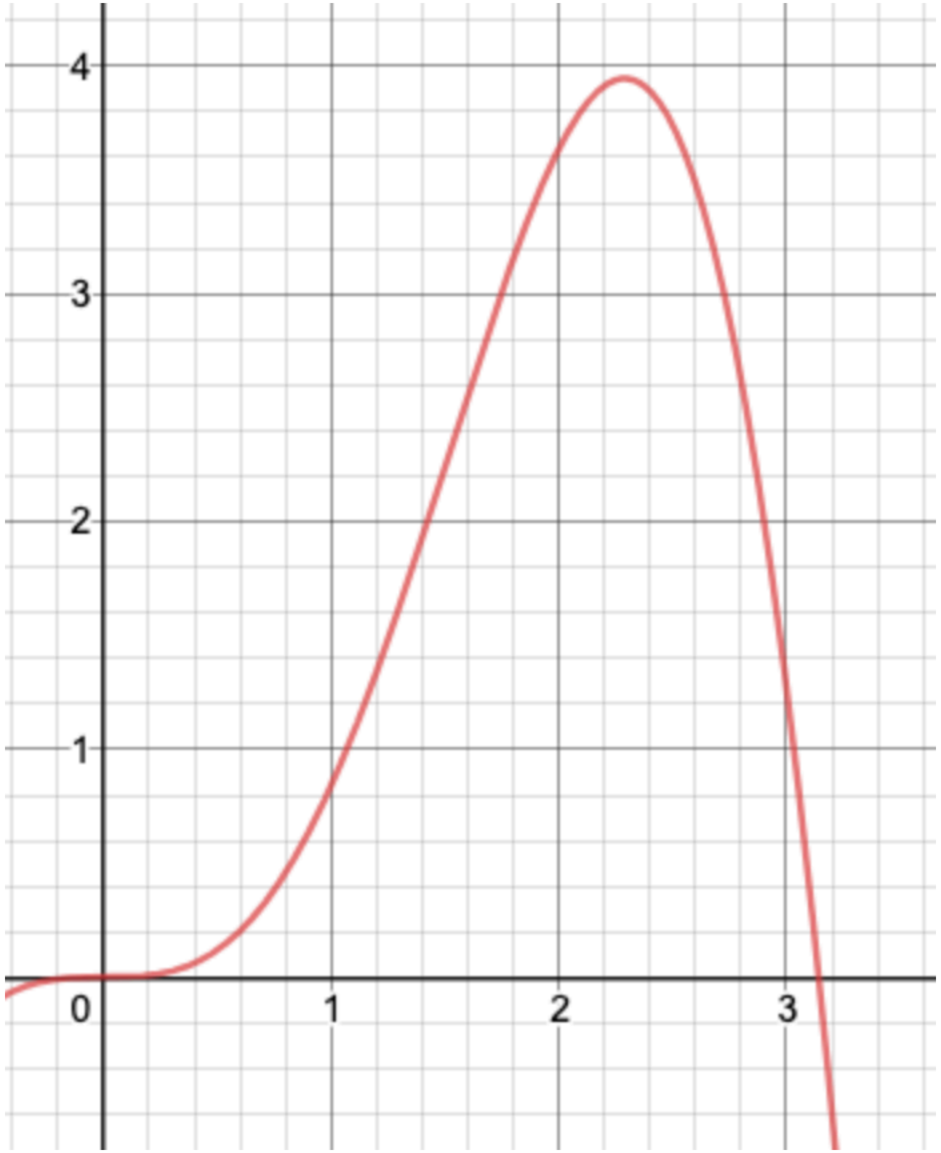
$y = 0.33x - 1$

$y = 0.75x - 3$

What about curvy lines?



No single slope!

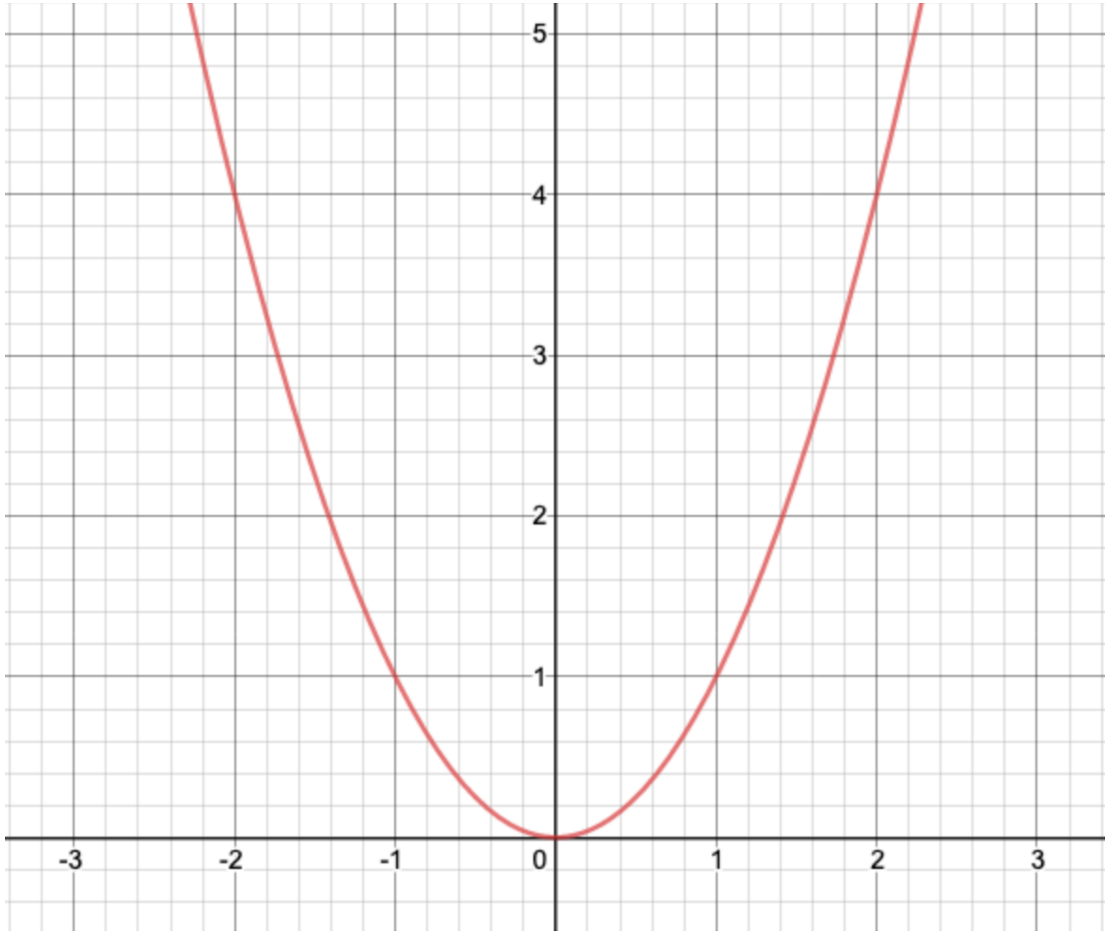


Slope is different at every x

Slope will be a *formula*, not a single number

Derivative

Basic derivatives



$$y = x^2$$

Power rule

Move exponent down to coefficient, reduce exponent by 1

$$y' = 2x$$

$$y = 3x^3 - 4x^2 + 6x - 1$$
$$y' = 9x^2 - 8x^1 + 6$$

$$y = 5x + 2$$
$$y' = 5$$

Your turn

$$y = 3x^2 - 4x + 8$$

$$y = -2x^4 - 2x + 100$$

$$y = 7x + 2$$

wolframalpha.com
"derivative 3x^2 – 4x + 8"

Partial derivatives

Power rule only works with 1 variable

$$u = xy$$

That means you can't figure out the derivative here!
It has x *and* y.

Partial derivatives

Do the x part first,
then do the y part

x part / y part

$$u = xy \qquad u' = \frac{y}{x}$$

Maximizing utility

Marginal rate of substitution (MRS)

Theoretical tradeoff between inputs

Slope of indifference curve

$$MRS = \frac{dy}{dx} = \frac{\Delta y}{\Delta x} = \frac{P_x}{P_y} = \frac{MU_x}{MU_y} = \frac{\partial u/\partial x}{\partial u/\partial y}$$

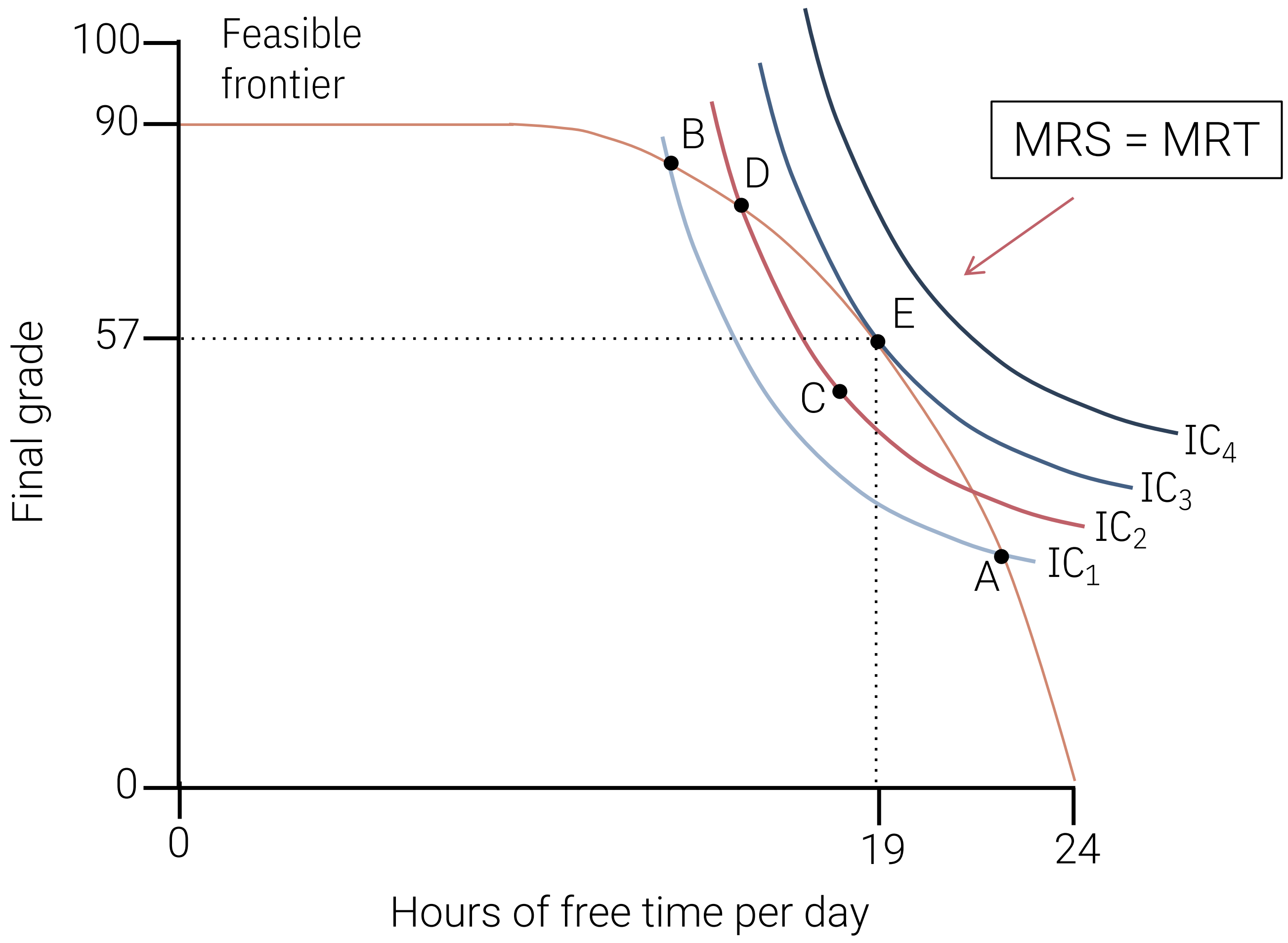
Marginal rate of transformation (MRT)

Actual tradeoff between inputs constrained by feasible frontier

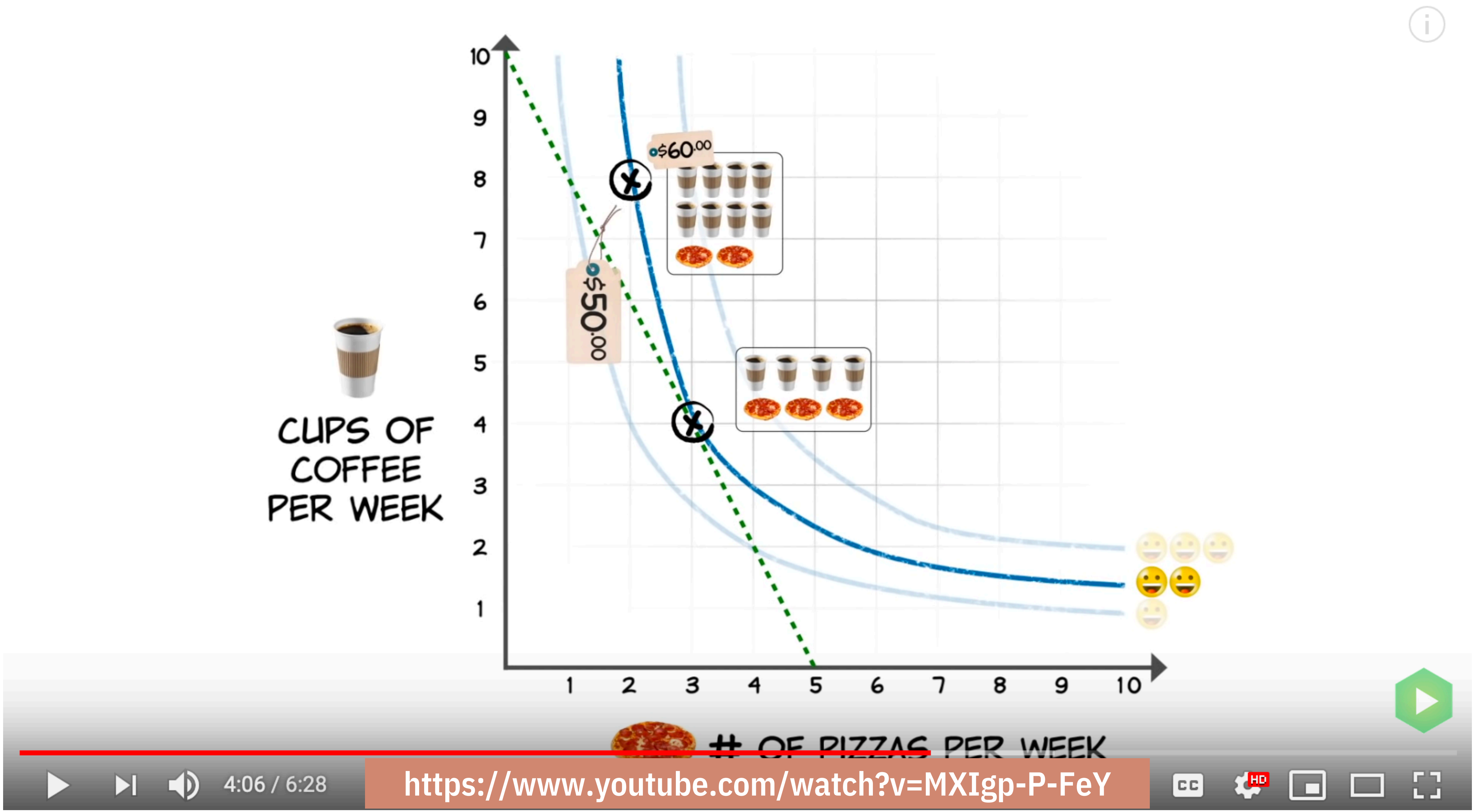
Slope of feasible frontier

What’s the best combination of hours studied / free time?

Where the ideal meets reality!



Feasible frontier
100
90
57
0
Final grade
B
D
E
C
A
MRS = MRT
IC4
IC3
IC2
IC1
0
19
24
Hours of free time per day



https://www.youtube.com/watch?v=MXIgp-P-FeY

Utility maximization

0. Plot indifference curve

1. Figure out feasible set or MRT
(budget line)

2. Use calculus and prices to figure out ideal MRS
($\Delta y / \Delta x$ = price x / price y = MUx / MUy)

3. MRT = MRS and solve for x and y

Waffles (x)	$1
Calzones (y)	$2
Utility	$u = xy$
Budget	$20