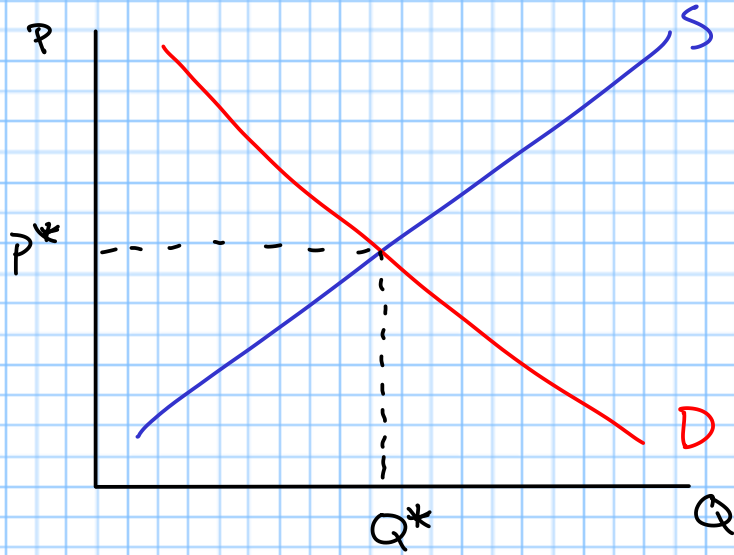
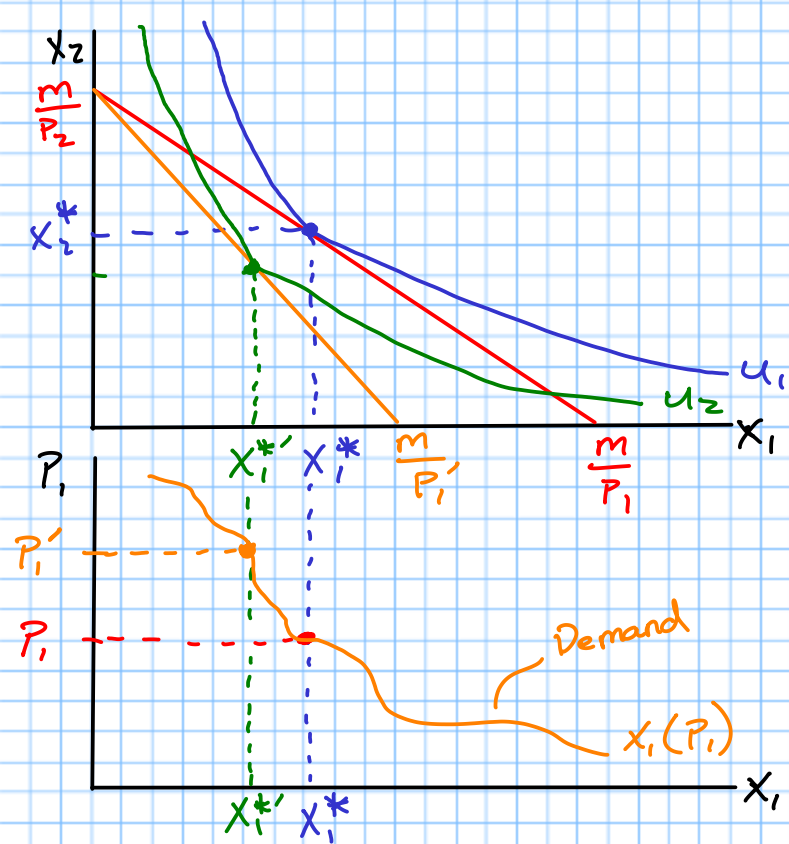


Demand

ECON 201:



- Consider a consumer with rational preferences and utility $u(x_1, x_2)$. There are prices P_1 and P_2 , and the consumer has an income m



$x_1(P_1)$ is a function
(demand function)

input: price P_1

output: optimal quantity
given the price

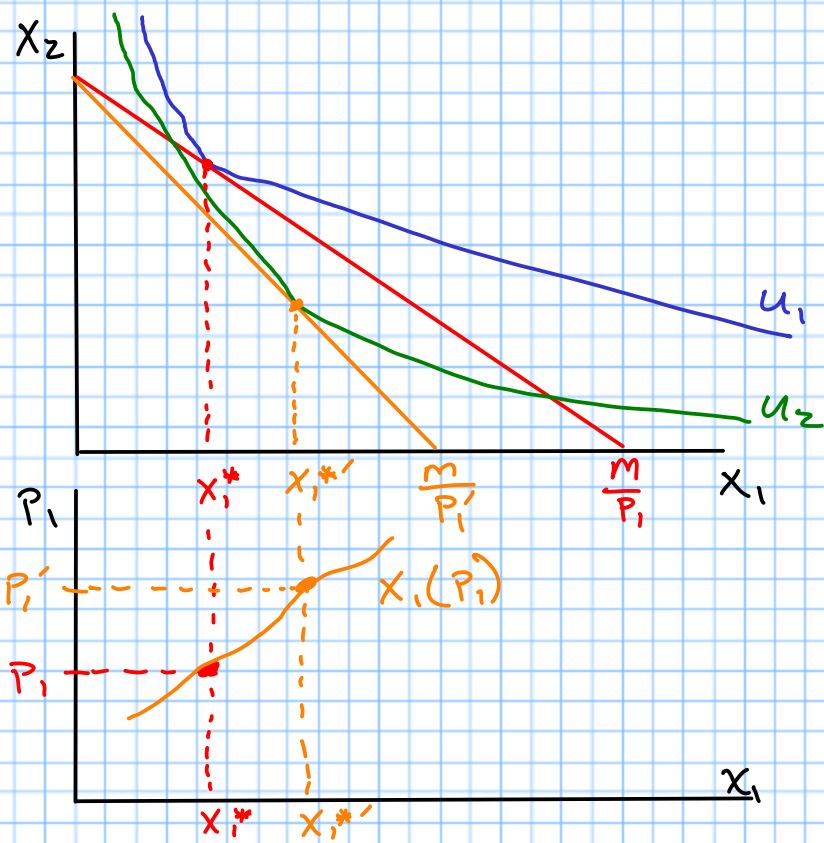
Slope of demand curves

$$\text{slope} = \frac{dx_1}{dP_1}$$

"Law of demand":

$$\frac{dx_1}{dP_1} < 0$$

- Demand curves are downward sloping



- In the rational choice model, the law of demand does not necessarily hold
- Definition: If $\frac{dx_1}{dp_1} > 0$,

then x_1 is said to be a Giffen good

Deriving demand mathematically

Consumer has utility

$$u(x_1, x_2) = x_1^3 x_2^6$$

$$m = 36 \quad p_1 = ? \quad (\text{leave it as a variable})$$

$$p_2 = 9$$

$$\textcircled{1} P_1 X_1 + 9 X_2 = 36$$

$$\textcircled{2} \frac{3 X_2}{6 X_1} = \frac{P_1}{9}$$

$$\frac{X_2}{2 X_1} = \frac{P_1}{9}$$

$$9 X_2 = 2 P_1 X_1$$

$$X_2 = \frac{2}{9} P_1 X_1$$

$$P_1 X_1 + 9 \left(\frac{2}{9} P_1 X_1 \right) = 36$$

$$P_1 X_1 + 2 P_1 X_1 = 36$$

$$3 P_1 X_1 = 36$$

$$P_1 X_1 = 12 \rightarrow \underline{X_1 = \frac{12}{P_1}}$$

Slope:

$$\frac{dx_1}{dP_1} = - \frac{12}{P_1^2} < 0$$

$$X_1 = 12 P_1^{-1}$$

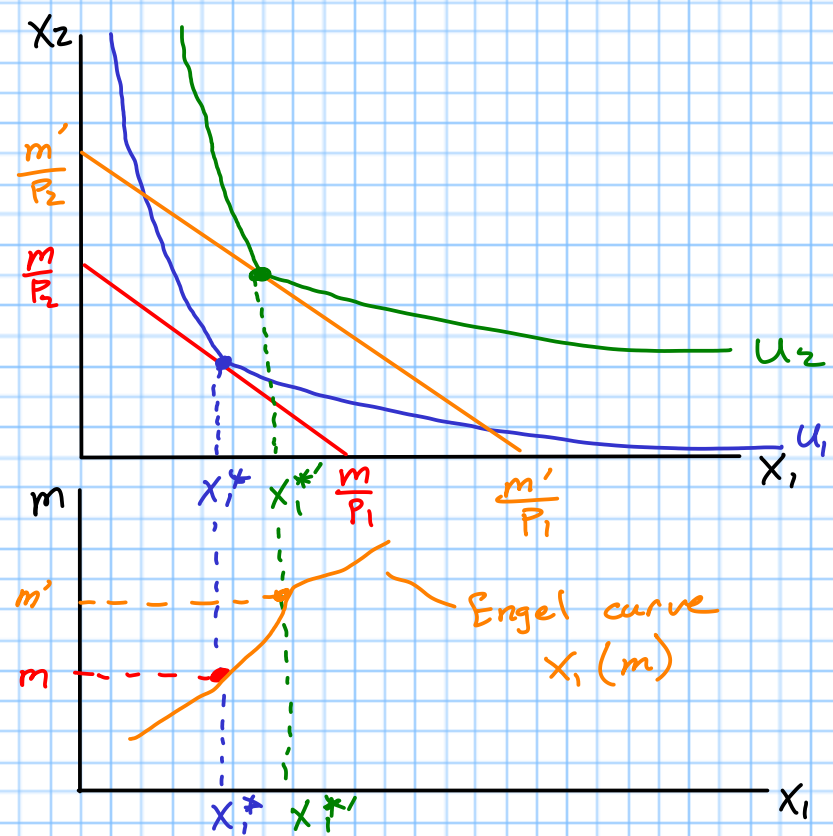
$$\frac{dx_1}{dP_1} = (-1) 12 P_1^{-2}$$

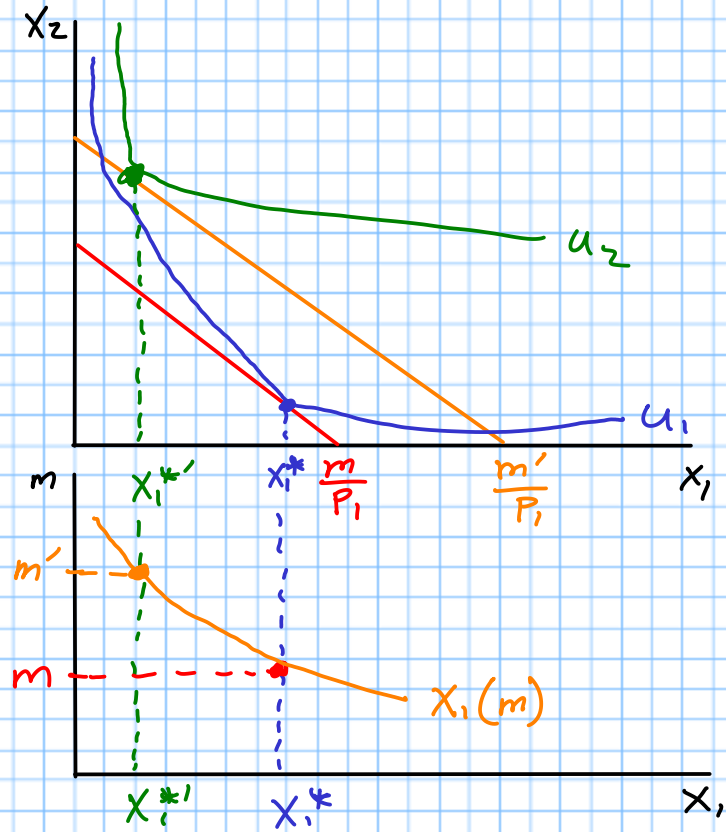
$$= - \frac{12}{P_1^2}$$

Cobb-Douglas utility functions never represent Giffen goods

Engel curves

- Demand curve: x_1 as a function of P_1
- Engel curve: x_1 as a function of m





Normal goods:

$$\frac{dx_1}{dm} > 0$$

→ Engel curve
slopes upward

Inferior goods

$$\frac{dx_1}{dm} < 0$$

→ Engel curve
slopes downward

Engel curves mathematically

$$u(x_1, x_2) = x_1^5 x_2^{25}$$

$$P_1 = 10 \quad P_2 = 7 \quad m = ?$$

$$\textcircled{1} 10x_1 + 7x_2 = m$$

$$\textcircled{2} \frac{5x_2}{25x_1} = \frac{10}{7}$$

$$\frac{x_2}{5x_1} = \frac{10}{7}$$

$$7x_2 = 50x_1$$

$$x_2 = \frac{50}{7}x_1$$

$$10x_1 + 7\left(\frac{50}{7}x_1\right) = m$$

$$10x_1 + 50x_1 = m$$

$$60x_1 = m$$

$$x_1 = \frac{m}{60}$$

Result: Cobb-Douglas Functions
always represent normal
goods