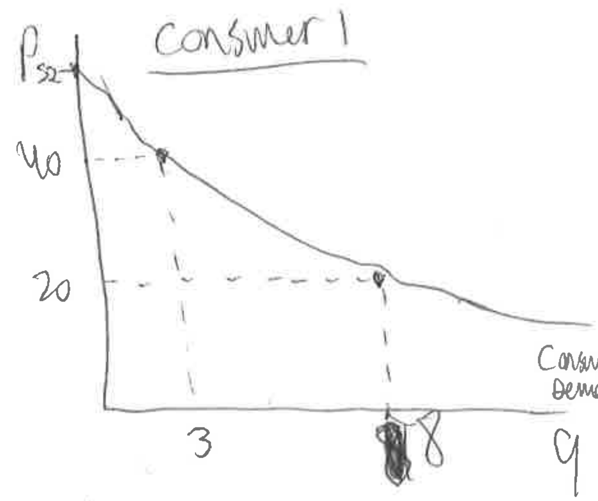
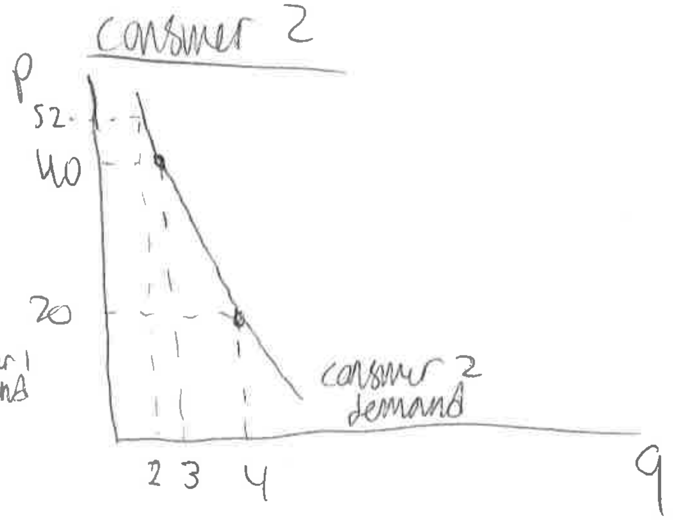
Lecture 8

The final step to linking consumer theory to market demand is to calculate market demand given individual consumer demand.

- market demand is the horizontal sum of individual demand curves.
  - → The market ~~demand~~ quantity demanded at each price is the sum of the individual quantities demanded at each price.
  - → The market demand curve is found by summing horizontally individual demand curves.
- Consider a graphical example of two consumers individual demand curves:





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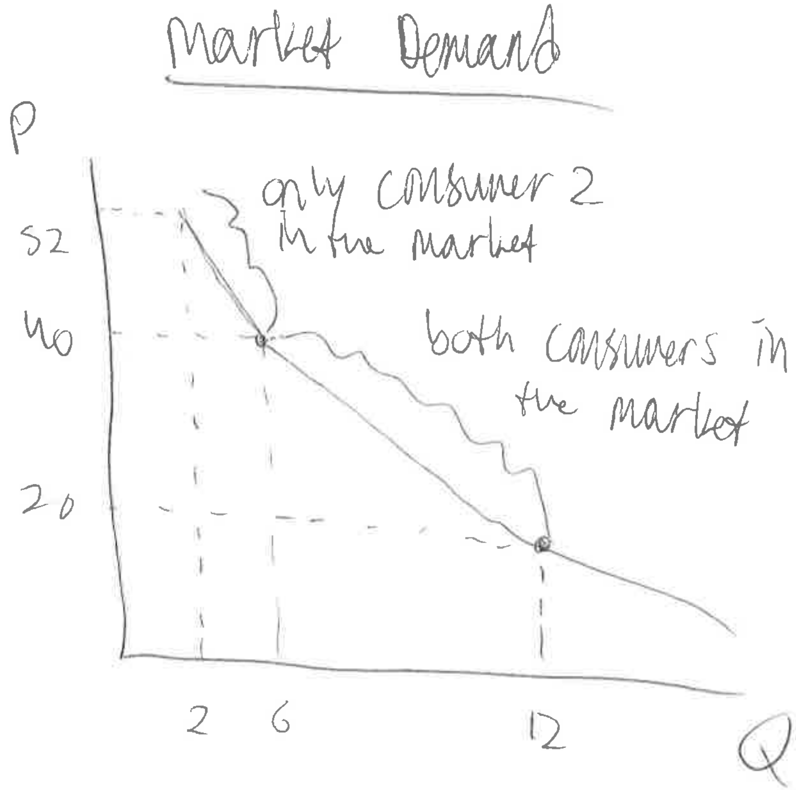
- Can you "horizontally" sum these two graphs into a graph of total market demand?



Mathematically: Suppose the individual demand equations for consumer 1 and 2 are $Q_1 = 13 - 0.25P$ and $Q_2 = 5 - 0.05P$, respectively. What is market demand? All we have to do is sum the two together (making sure that we have $Q = \ldots P$, i.e. solving for Q_1 and Q_2, then adding together).

$$Q_{market} = Q_1 + Q_2 = 13 - 0.25P + 5 - 0.05P$$

$$\boxed{Q_{market} = 18 - 0.3P}$$

Example: Eli budgets \$80 per week for coffee (X) and muffins (Y). His preferences are given by $U(X,Y) = XY$.

a) Find his optimal bundle when $P_X = 2$ and $P_Y = 5$

i.e. $\max_{\{x,y\}} u(x,y) = xy$ s.t. $80 = 2x + 5y$

Tangency condition:

$$MRS_{xy} = \frac{P_x}{P_y} \qquad MRS_{xy} = \frac{MU_x}{MU_y} = \frac{y}{x}$$

$$\frac{y}{x} = \frac{2}{5} \Rightarrow y = \frac{2}{5}x$$

plug into constraint:

$$80 = 2x + \cancel{5}\left(\frac{2}{\cancel{5}}x\right)$$

$$4x = 80$$

$$x^* = 20 \qquad y = \frac{2}{5}(20)$$

$$y^* = 8$$

b) Find his optimal bundle when $P_x=4$ and $P_y=5$ (4)

Our tangency condition now becomes:

$$\frac{y}{x} = \frac{4}{5}$$

$$\Rightarrow y = \frac{4}{5}x$$

plugging into our updated budget constraint:

$$80 = 4x + 5\left(\frac{4}{5}x\right)$$

$$8x = 80$$

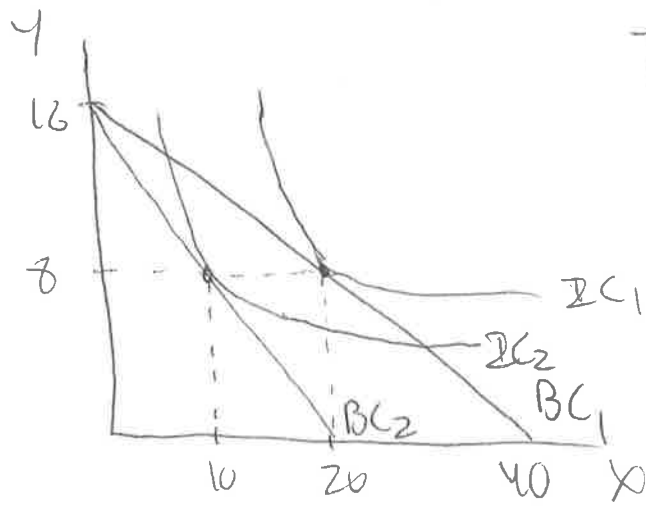
$$x^* = 10 \qquad y = \frac{4}{5}(10)$$

$$y^* = 8$$

Lets graph what we just solved in a) & b).
First our initial budget constraint: $80 = 2x + 5y$
and optimal bundle (20, 8).

$$5y = 80 - 2x$$

$$y = 16 - \frac{2}{5}x$$



Then our updated budget constraint and new optimal bundle: (10, 8)

$$80 = 4x + 5y$$

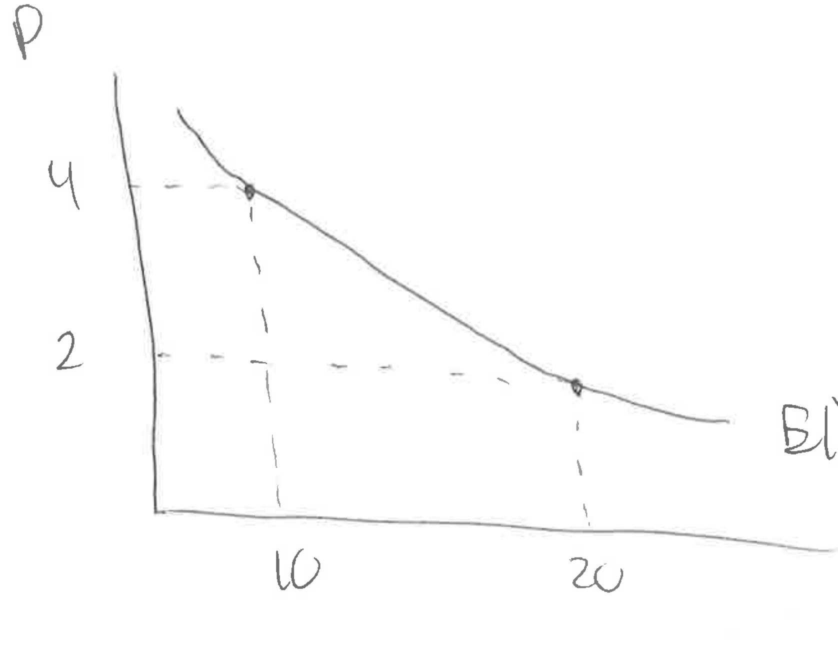
$$5y = 80 - 4x$$

$$y = 16 - \frac{4}{5}x$$

c) draw Eli's demand for coffee

when $P_x = 2$, $x^* = 20$

when $P_x = 4$, $x^* = 10$



d) what is the mathematical equation for Eli's individual demand? $p = $ y-intercept $-$ slope $\cdot q$

First note the slope: $\frac{\text{rise}}{\text{run}} = \frac{-4}{20} = -\frac{1}{5}$

Now to calculate the y-intercept, plug in values:

$$p = -\frac{1}{5}q + z$$

$$2 = -\frac{1}{5}(20) + z$$

$$2 = -4 + z$$

$$z = 6$$

Hence our individual demand is:

$\boxed{p = 6 - \frac{1}{5}q}$ ← This is inverse demand

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e) spps Eli is a representative consumer in this market and there are 1,000 consumers in total. What is total market demand?

$$p = 6 - \frac{1}{5}q$$

First we must ~~get~~ solve this equation for q:

$$\frac{1}{5}q = 6 - p$$

$$q = 30 - 5p$$

Now we can sum horizontally for 1,000 consumers, or multiply the right-hand-side by 1000.

$$q = 1000(30 - 5p)$$

$$\boxed{Q_D = 30{,}000 - 5{,}000\,p}$$