Elements of Microeconomics: TA Session

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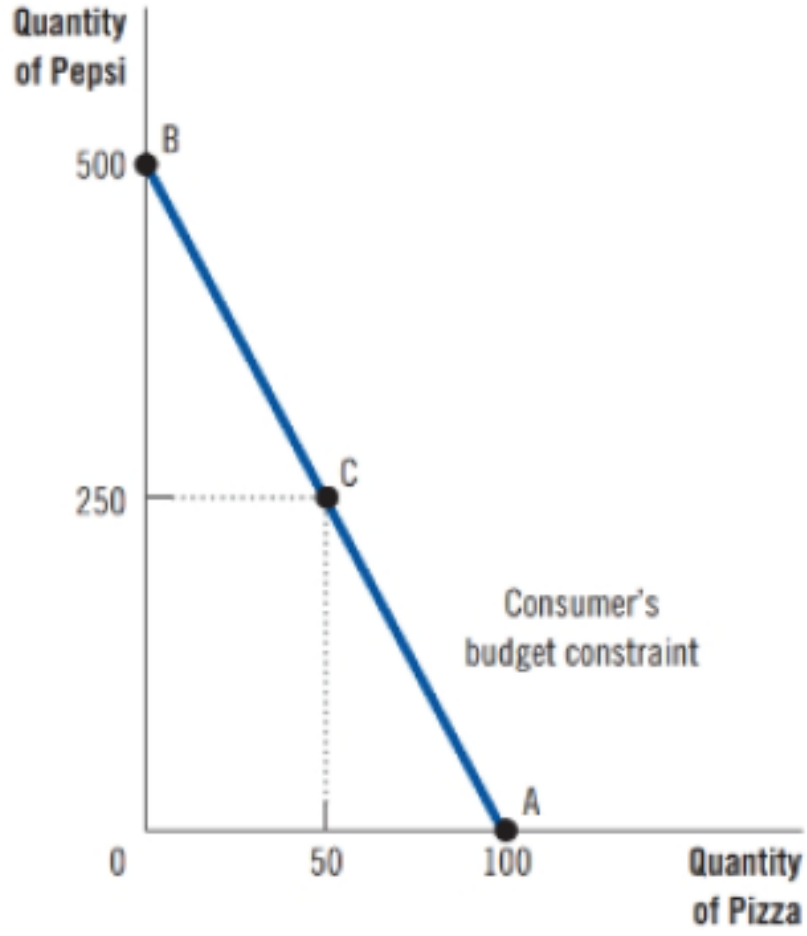
Reminder

Remember to take the weekly quizzes on Canvas!

Budget constraint

Budget constraint: the limit on the consumption bundles that a consumer can afford



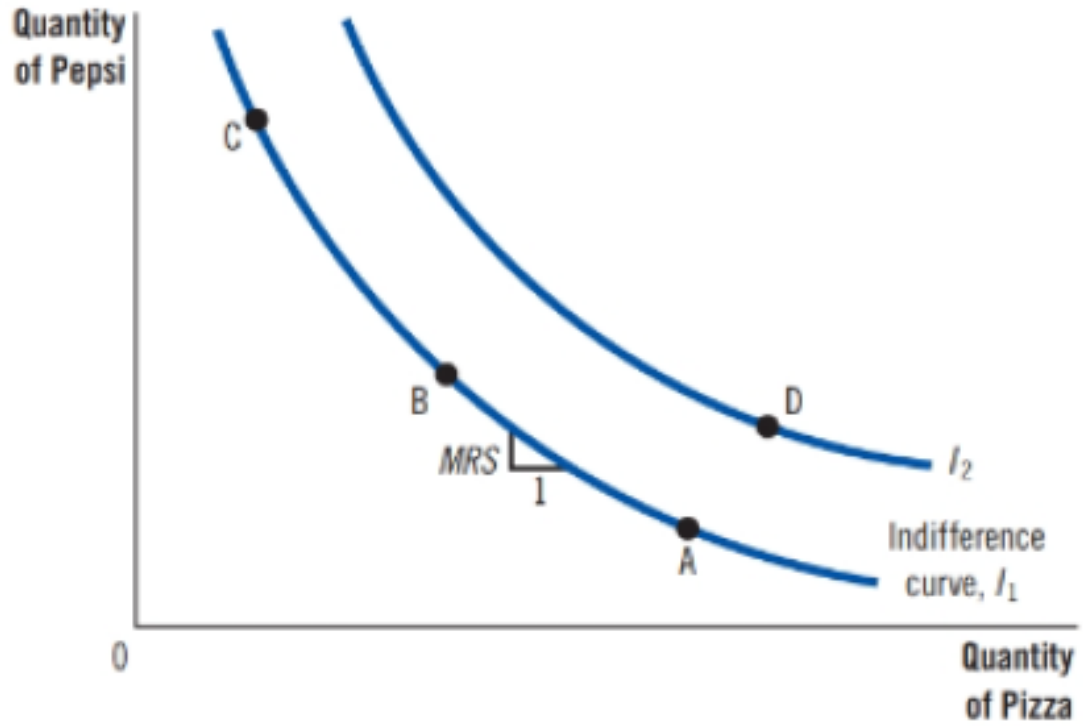
The "relative price" of pizza is 5 Pepsis per pizza

Indifference curve

Indifference curve: a curve that shows consumption bundles that give the consumer the same level of satisfaction (in economics jargon, the level of satisfaction is called "utility")

- Consumer is indifferent between points on the same indifference curve

Below is an example of a typical indifference curve:



Marginal rate of substitution

Marginal rate of substitution: the rate at which a consumer is willing to trade one good for another

- MRS at a point on the indifference curve equals the (absolute value of) slope of the indifference curve at that point

Indifference curves usually have an inwardly bowed shape (see previous slide). This reflects the principle of **diminishing marginal rate of substitution:** if you have 1 pizza, an additional pizza could bring you a lot of satisfaction; but if you already have 20 pizzas, you've probably become fed up with pizzas, and an additional pizza no longer brings you much satisfaction.

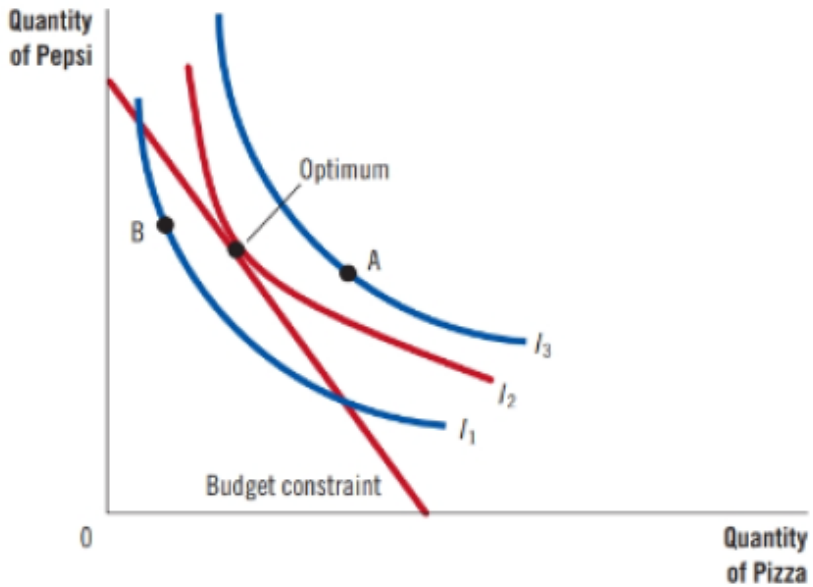
- Diminishing marginal rate of substitution is reflected in the decreasing slope of the indifference curve as we move to the right on the curve
- Special cases: If two goods are perfect substitutes, the indifference curve is a straight line. If they're perfect complements, the indiff curve has a L-shape (see p.451 of Mankiw)

Properties of indifference curves

1. Higher indifference curves are preferred to lower ones
2. Indifference curves slope downward
3. Indifference curves do not cross
4. Indifference curves are usually bowed inward

Consumer's optimum

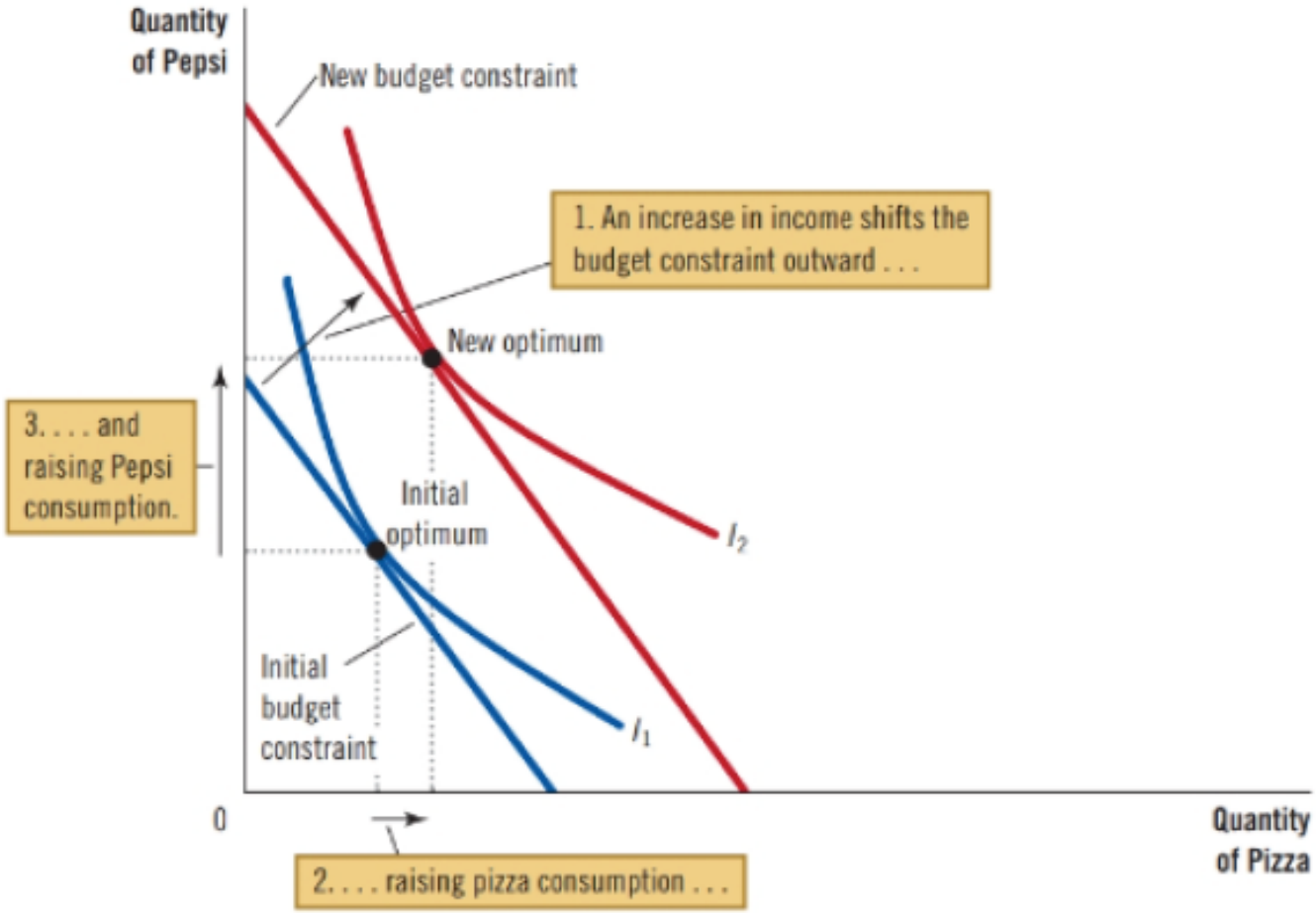
Consumer's optimum is the point on her budget constraint that lies on the highest indifference curve. In a graph, the budget constraint would be tangential to this indifference curve:



At optimum, the slope of the indifference curve equals the slope of budget constraint: MRS = relative price

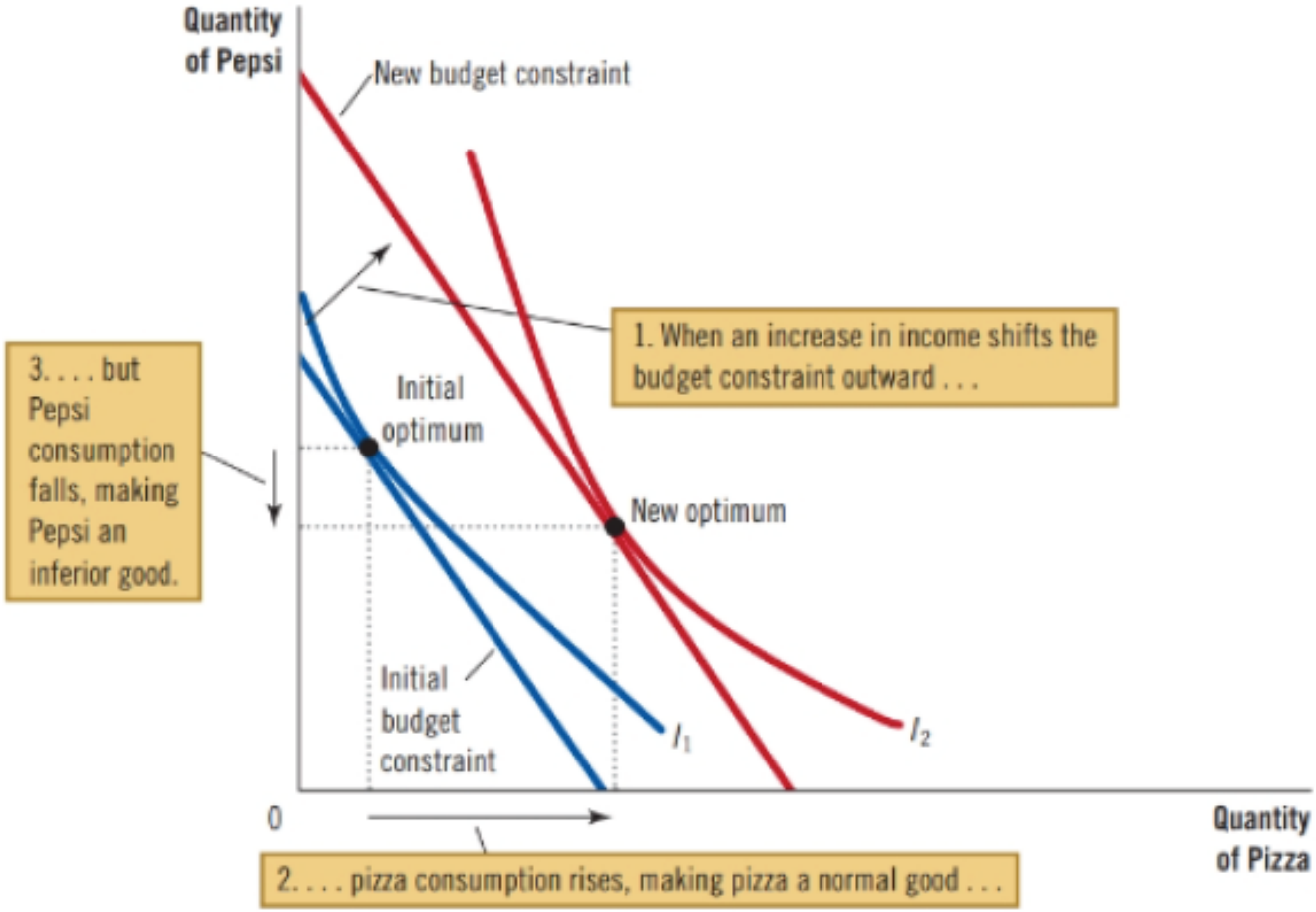
Normal good

Normal good: a good for which an increase in income raises the quantity demanded



Inferior good

Inferior good: a good for which an increase in income reduces the quantity demanded



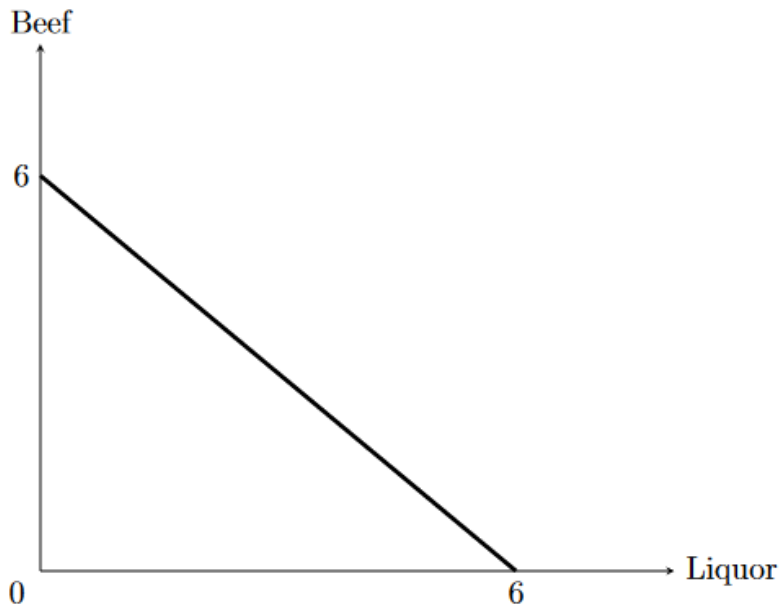
Consumer choice exercise

Joe earns \$300 per week, with which he buys two goods: liquor and beef. A bottle of liquor costs \$50, and a pound of beef costs \$50. Suppose he prefers to have liquor and beef together: he would like 1 bottle of liquor for every two pounds of beef he eats.

1. Draw Joe's weekly budget constraint.
2. Are beef and liquor substitutes or complements for Joe? Draw his indifference curves.
3. How much liquor and beef will he choose to consume?
4. Now we allow the price of liquor to change while holding other things constant. Suppose the price of liquor is p, and the quantity of liquor demanded is q. Derive and draw Joe's demand curve for liquor.
5. Now suppose Joe's preferences have changed: 1 bottle of liquor gives him the same satisfaction as 2 pounds of beef. Redo questions (2)-(4).

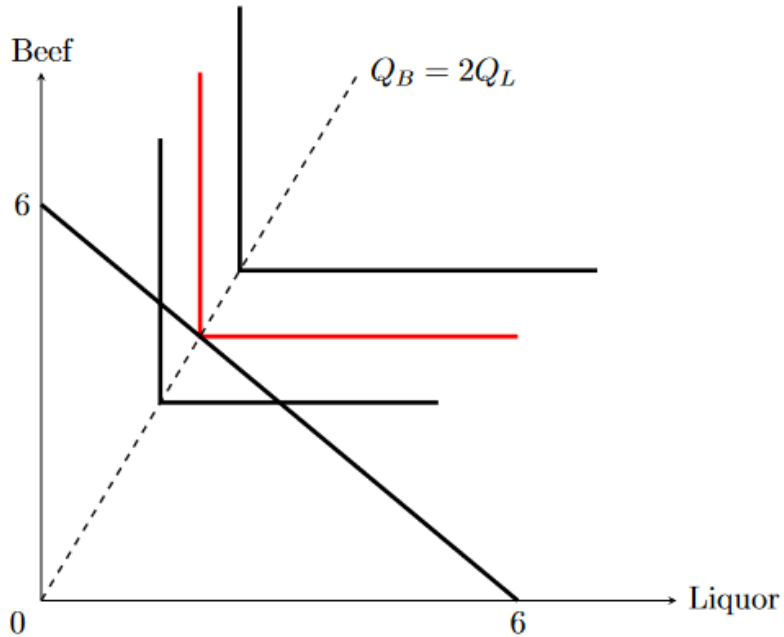
Consumer choice exercise - explained

1. The budget constraint is
   $50Q_B + 50Q_L = 300 \quad \Longrightarrow \quad Q_B + Q_L = 6$:



Consumer choice exercise - explained

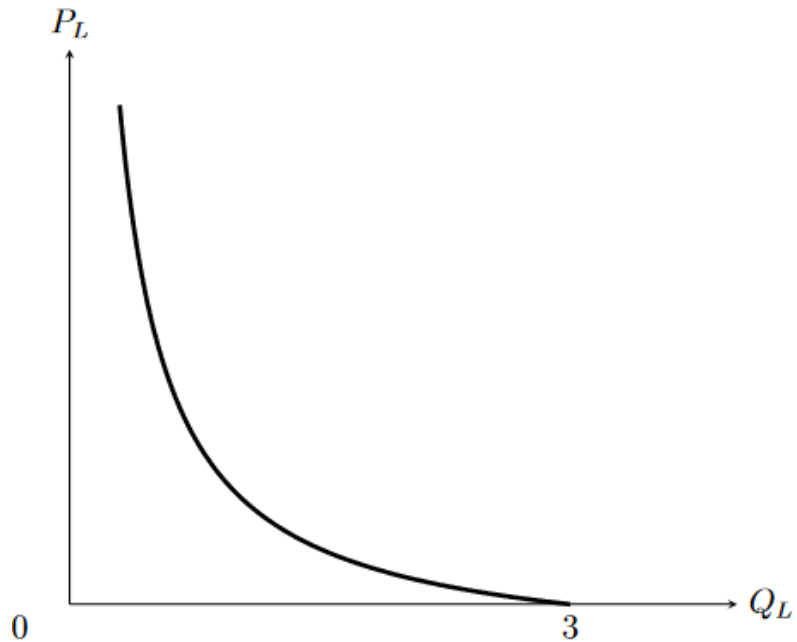
2. They're complements. The indifference curves is drawn below. The "kinks" of the ICs pass $Q_B = 2Q_L$.



3. The optimal choice lies where the budget constraint intersects with the kink of an indifference curve. This IC is drawn above in red: $2Q_L = Q_B = 6 - Q_L \implies Q_B = 4, Q_L = 2$

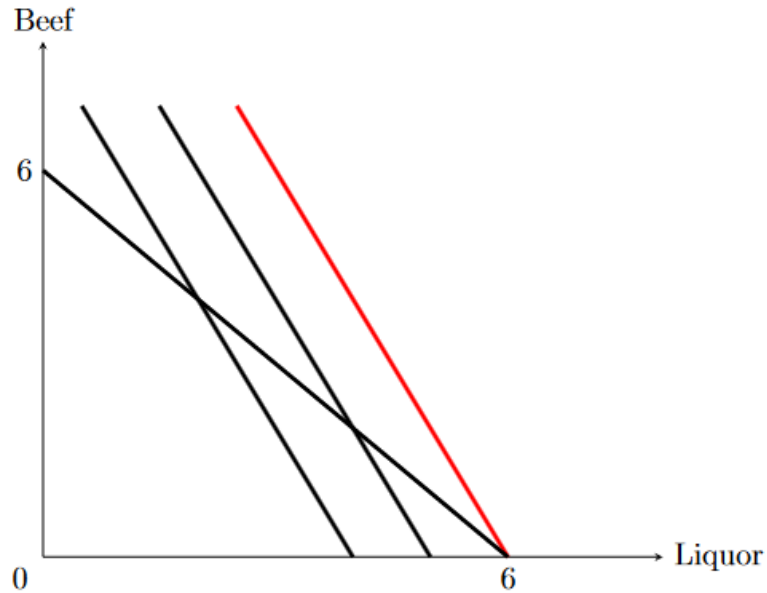
Consumer choice exercise - explained

4. His budget constraint: $P_L Q_L + 50 Q_B = 300$
   His optimal consumption satisfies: $Q_B = 2 Q_L$
   Putting the two above equations together:
   $P_L Q_L + 100 Q_L = 300$
   $\Longrightarrow \quad P_L = \frac{300}{Q_L} - 100$



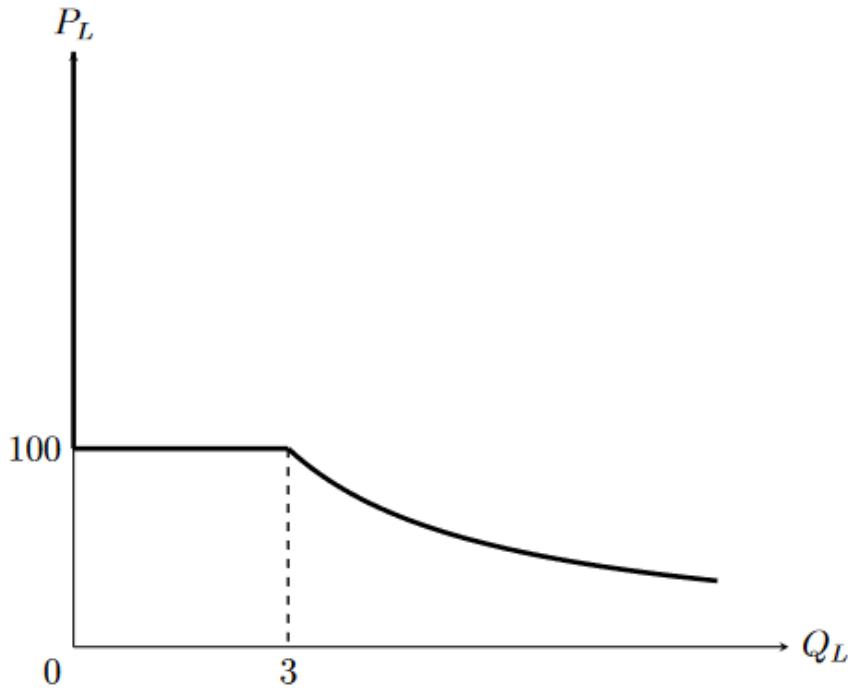
Consumer choice exercise - explained

5. See graph below. The indifference curves have a slope of -2. The highest IC that intersects with BC is the red one, which gives us the optimal consumption of 6 bottles of liquor and 0 pound of beef.



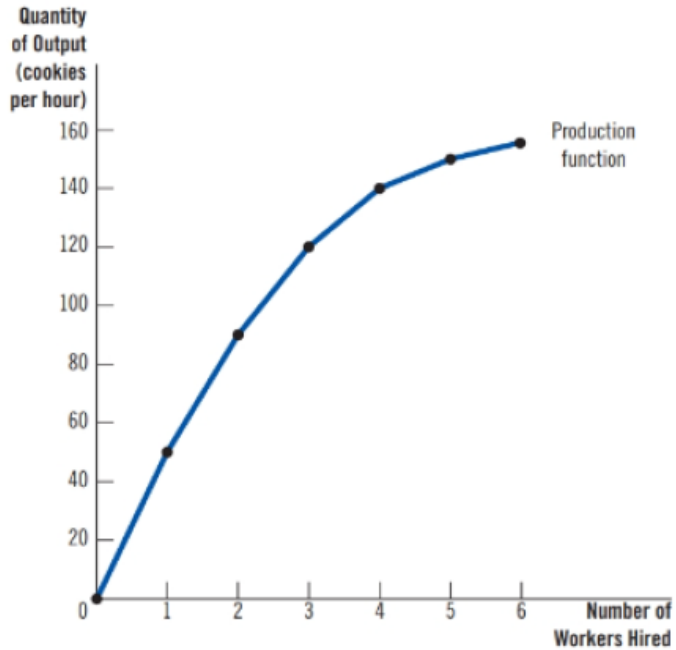
Consumer choice exercise - explained

When $0 < P_L < 100$: the analysis in the previous slide holds: he consumes liquor only. We have $P_L Q_L = 300 \implies P_L = 300/Q_L$
When $P_L = 100$: one of the indifference curves exactly overlaps with budget constraint. Joe is indifferent on the entire BC: he'll choose to consume $0 < Q_L < 3$.
When $P_L > 100$: BC is steeper than ICs, the highest IC that intersects with BC will give a consumption of 6 beef and 0 liquor. In this case, Joe consumes 0 bottles of liquor.
The demand curve is drawn below:



The production function

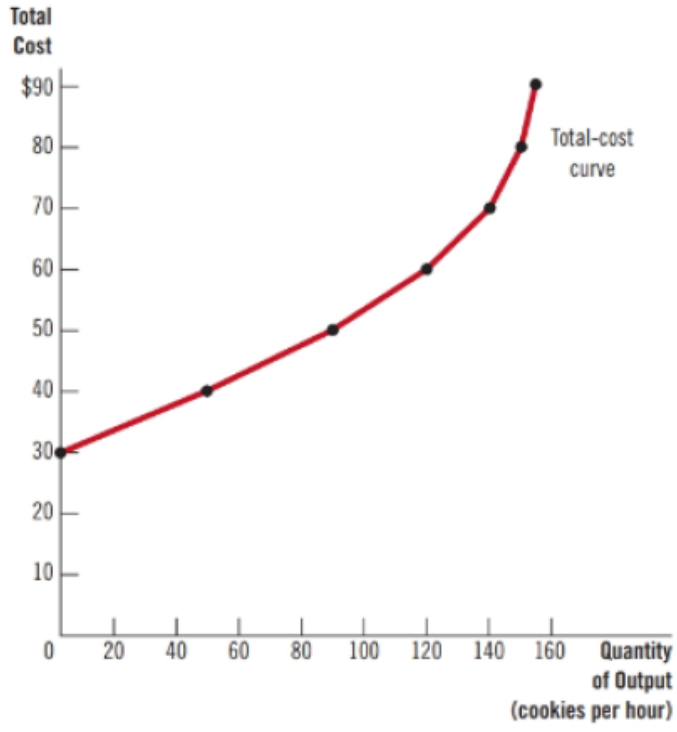
The production function: the relationship between the quantity of inputs used to make a good and the quantity of output of that good



Marginal product: the increase in output that arises from an additional unit of input

- This production function has diminishing marginal product

Total cost curve



Fixed costs: costs that do not vary with the quantity of output

- On a total cost graph, fixed costs is the total cost when output is 0

Variable costs: costs that vary with the quantity of output

Average and marginal cost

$$\text{Average total cost} = \frac{\text{Total cost}}{\text{Quantity of output}}$$

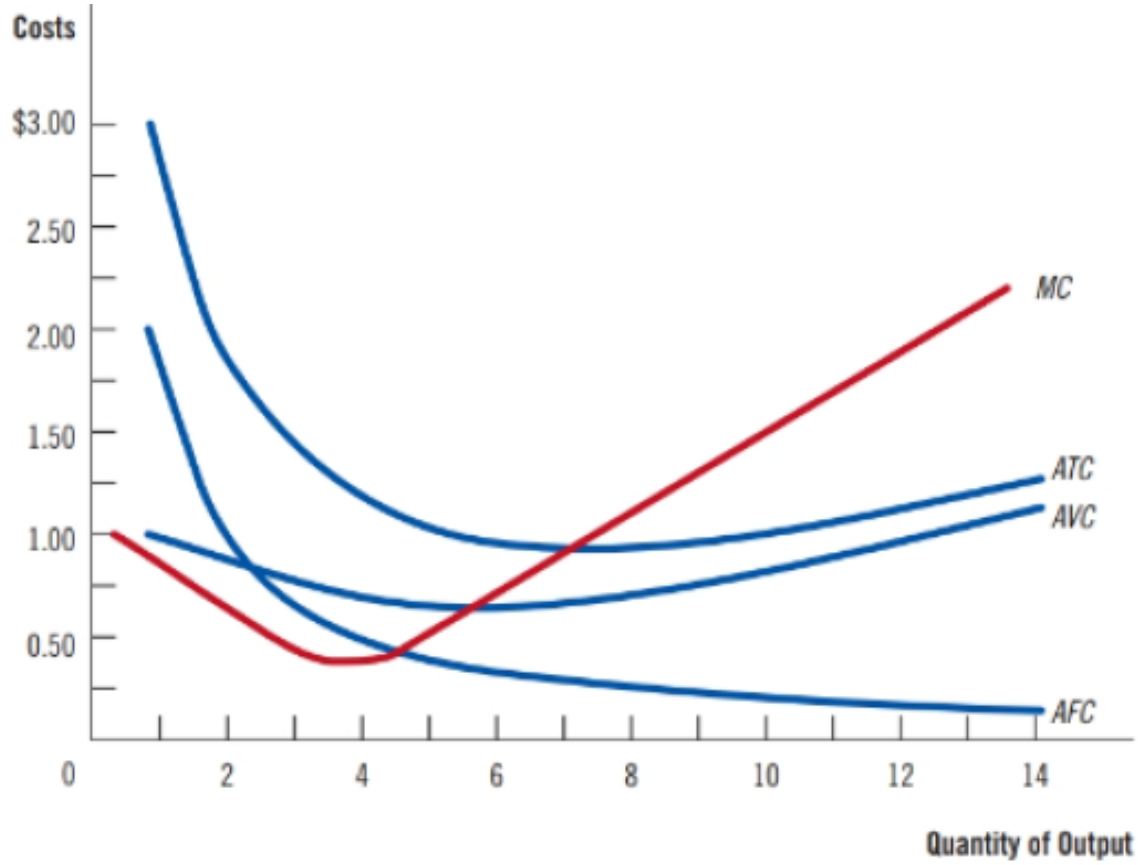
$$\text{Average fixed cost} = \frac{\text{Fixed cost}}{\text{Quantity of output}}$$

- Average fixed cost is always decreasing with quantity of output

$$\text{Average variable cost} = \frac{\text{Variable cost}}{\text{Quantity of output}}$$

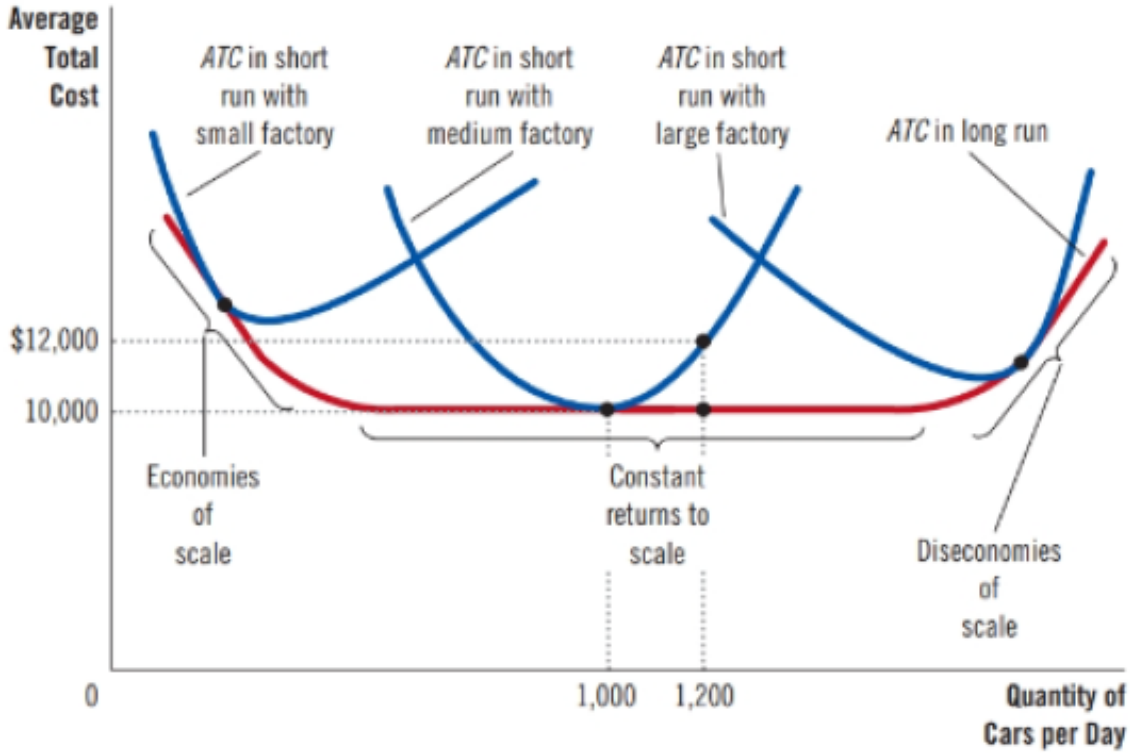
$$\text{Marginal cost} = \frac{\text{(marginal) change in total cost}}{\text{(marginal) change in quantity of output}}$$

Typical cost curves



- ATC curve is U-shaped
- MC eventually rises with quantity
- ATC is falling $\iff$ MC $<$ ATC
- ATC is rising $\iff$ MC $>$ ATC
- The MC and ATC curves cross where ATC is lowest

Costs in the short run vs. the long run



Economies of scale: the property whereby long-run ATC falls as quantity increases

Constant returns to scale: the property whereby long-run ATC stays the same as quantity increases

Diseconomies of scale: the property whereby long-run ATC rises as quantity increases

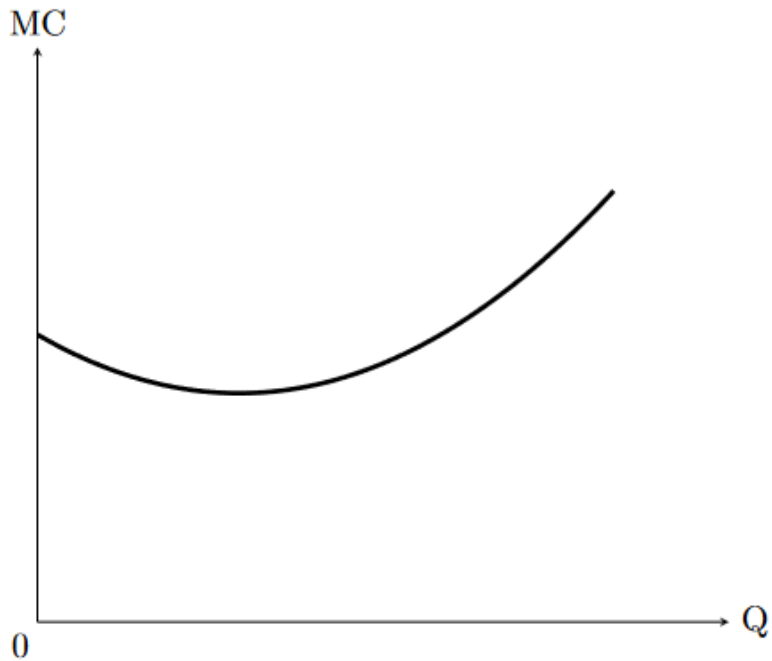
Marginal cost exercise

The following exercise helps us better understand marginal cost.

1. Draw a typical marginal cost curve and explain its shape.
2. Given a certain quantity q_1, can you show the firm's fixed cost using this MC curve? If so, identify it on the graph; if not, explain why.
3. Given a certain quantity q_1, can you show the firm's variable cost using this MC curve? If so, identify it on the graph; if not, explain why.
4. Given a certain quantity q_1, can you show the firm's total cost using this MC curve? If so, identify it on the graph; if not, explain why.

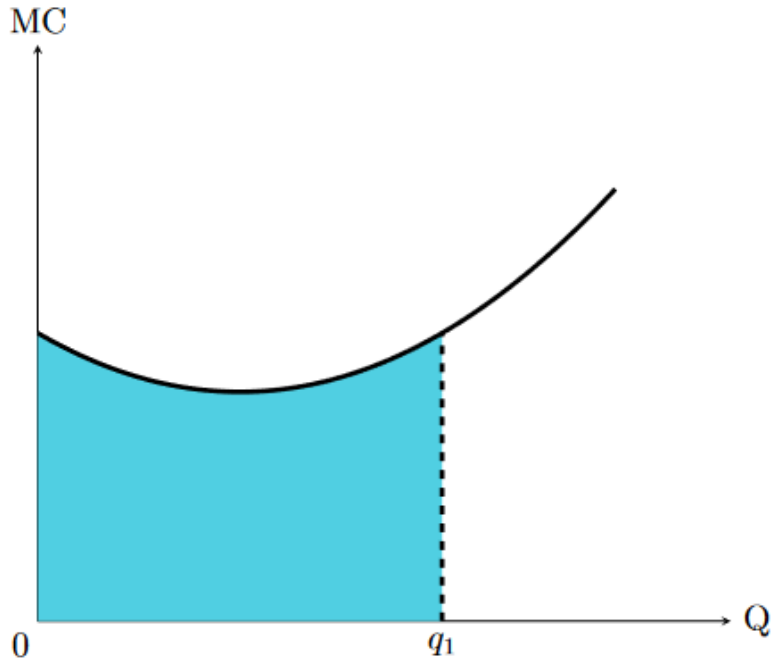
Marginal cost exercise - explained

1. See graph below. A typical MC curve is U-shaped. At low quantities, when quantity increases, the firm is able to better allocate its resources (e.g. because of specialization), causing MC to decrease. But when quantity has increased enough, the law of diminishing marginal product eventually settles in, and MC increases.



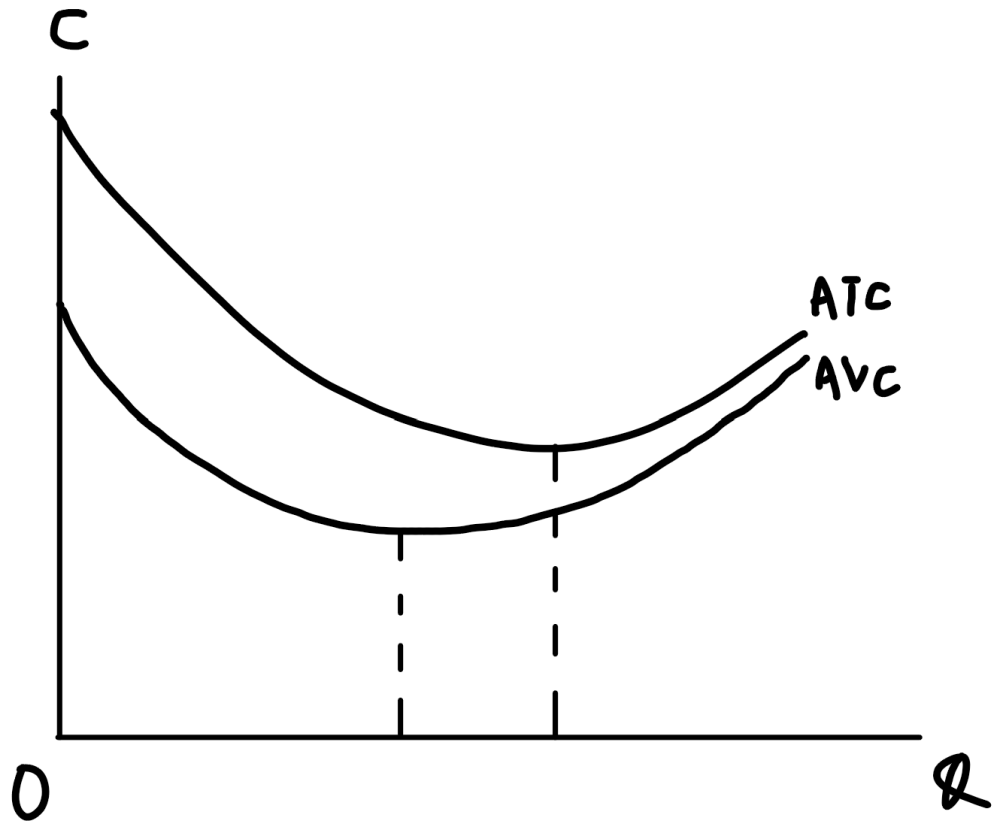
Marginal cost exercise - explained

2. No. Fixed cost does not vary with the quantity of output, and is not reflected in the MC of each unit of output.
3. Yes. See graph below: the variable cost of each unit of output is the corresponding area of that unit under the MC curve. So, the variable cost of the entire firm at output q_1 is the blue shaded area under the MC curve.
4. No. Recall that TC=VC+FC. We know from above that VC can be expressed using the graph but FC cannot, so their sum also cannot be identified with the graph.



Marginal cost exercise

The following is a graph of the ATC and AVC curves of a factory. Draw its MC curve on the graph. (Start from $Q = 0$ and assume quantity is continuous.)



Marginal cost exercise - explained

See graph below. Three things to note:

- At $Q = 0$, MC starts from the same point as AVC, because when the firm produces the first tiny bit of output, its VC really just consists of the MC of that bit of output. (Think about the scenario of $Q = 1$ when output is only allowed to be integers.)
- MC crosses ATC at the point where ATC is lowest
- MC crosses AVC at the point where AVC is lowest, the reason is the same as with ATC