Microeconomics EC4101
Tutorial 1

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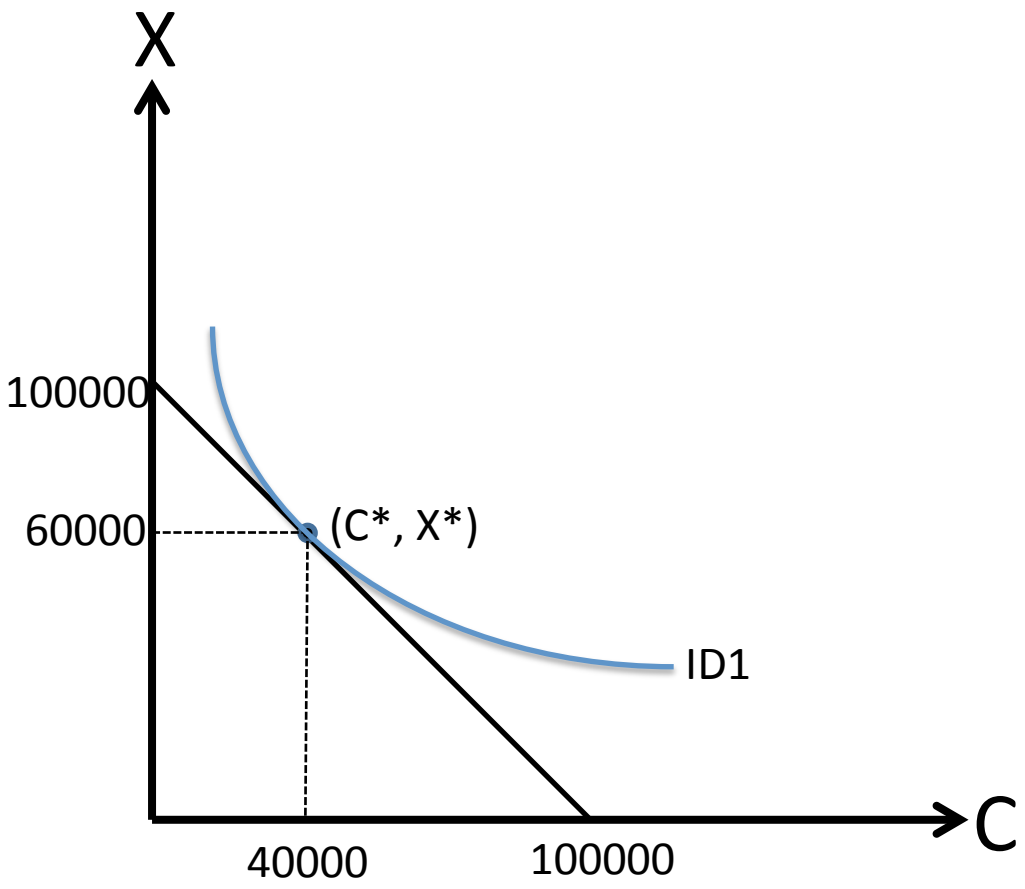
Concepts Involved

- Preference (complete, transitive binary relations)
- Utility (continuous, monotonic preferences)
- Concept of Indifference Curves and Budget Constraint
- Utility Maximisation Problem
- Budget Set

Question 1

- Budget = $100000
- 2 goods: computers (C) and others (X)
- C* = $40000, X* = $60000

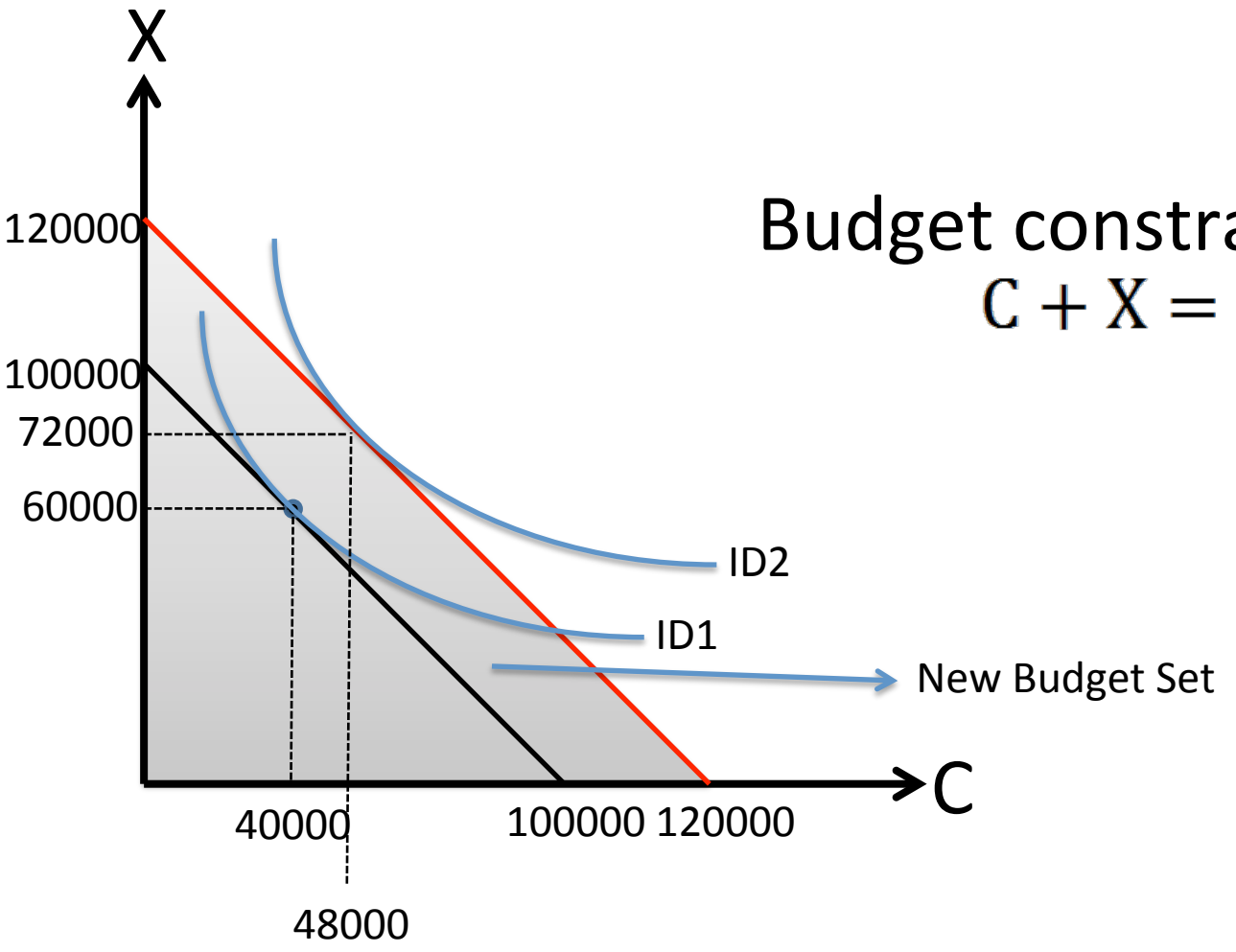
Question 1



Plan A

- Unrestricted grant of $20000
- Budget rises from $100000 to $120000
- Budget constraint shifts right (outwards)

Plan A: Grant of $20000



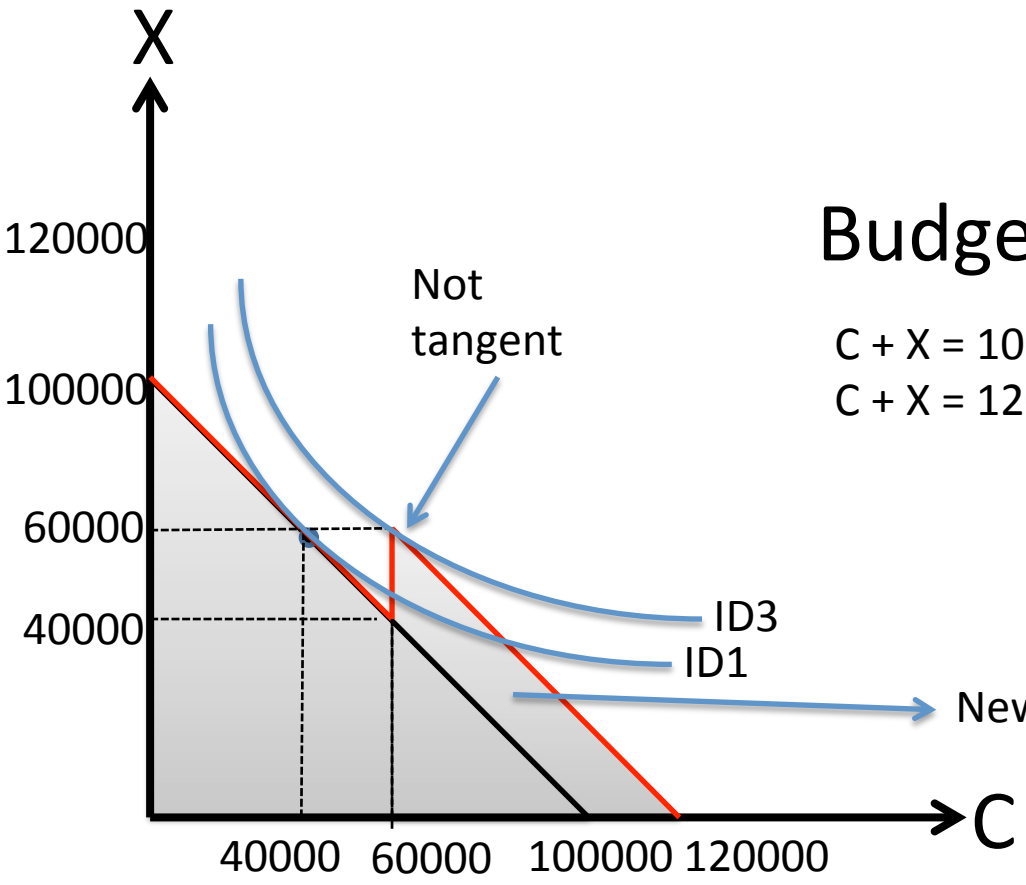
Budget constraint becomes

$$C + X = 120000$$

Plan B

- Restricted grant of $20000
- Budget rises from $100000 to $120000 if and only if C rises by $20000 or more (from $40000 to $60000)
- Budget constraint has a jump

Plan B: Grant of $20000 given spending on C is at least $60000



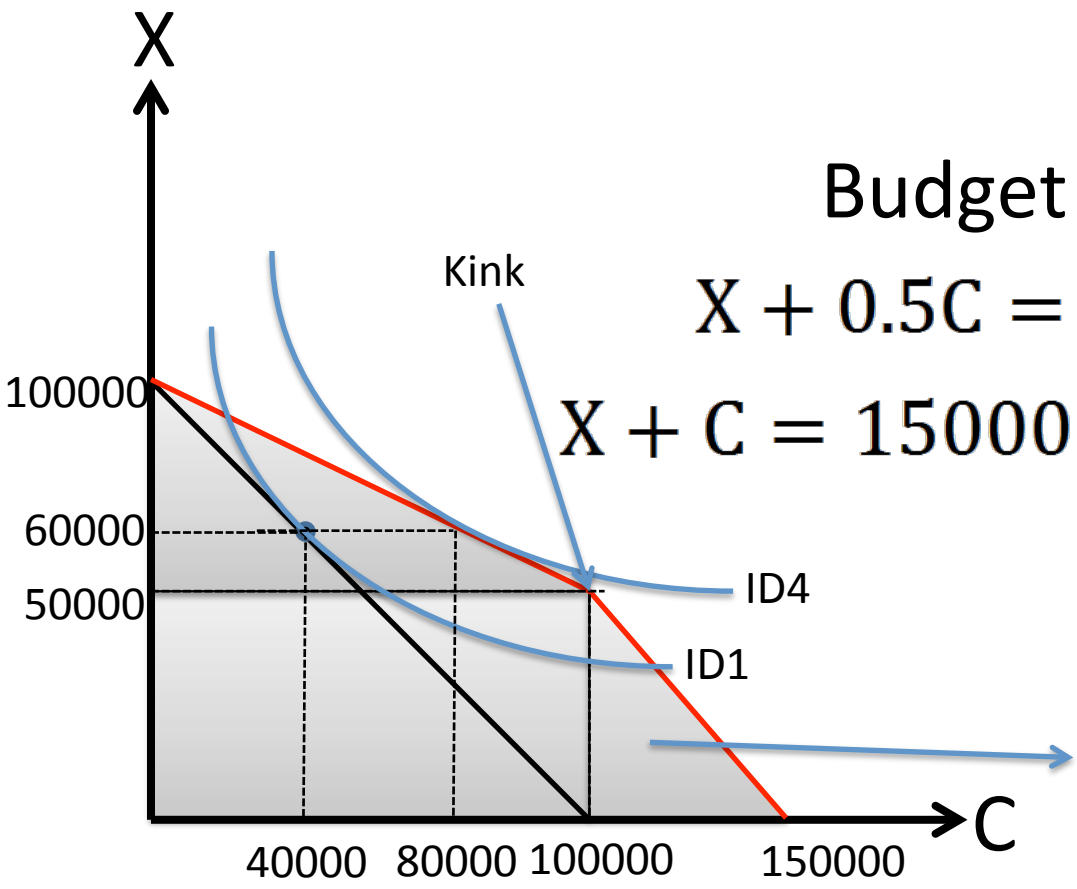
Budget constraint becomes

C + X = 100000, C < 60000
C + X = 120000, C >= 60000

Plan C

- Matching grant with no upper limit
- 2 possibilities
  - Possibility 1: Usage of received grant does NOT trigger further grant
  - Possibility 2: Usage of received grant still triggers further grant (iterative)
- Effectively halves the price of C when there is grant
- Budget constraint has a kink (P1) vs no kink (P2)

Plan C: Grant of $0.50 for every $1 spent on computer (Possibility 1)



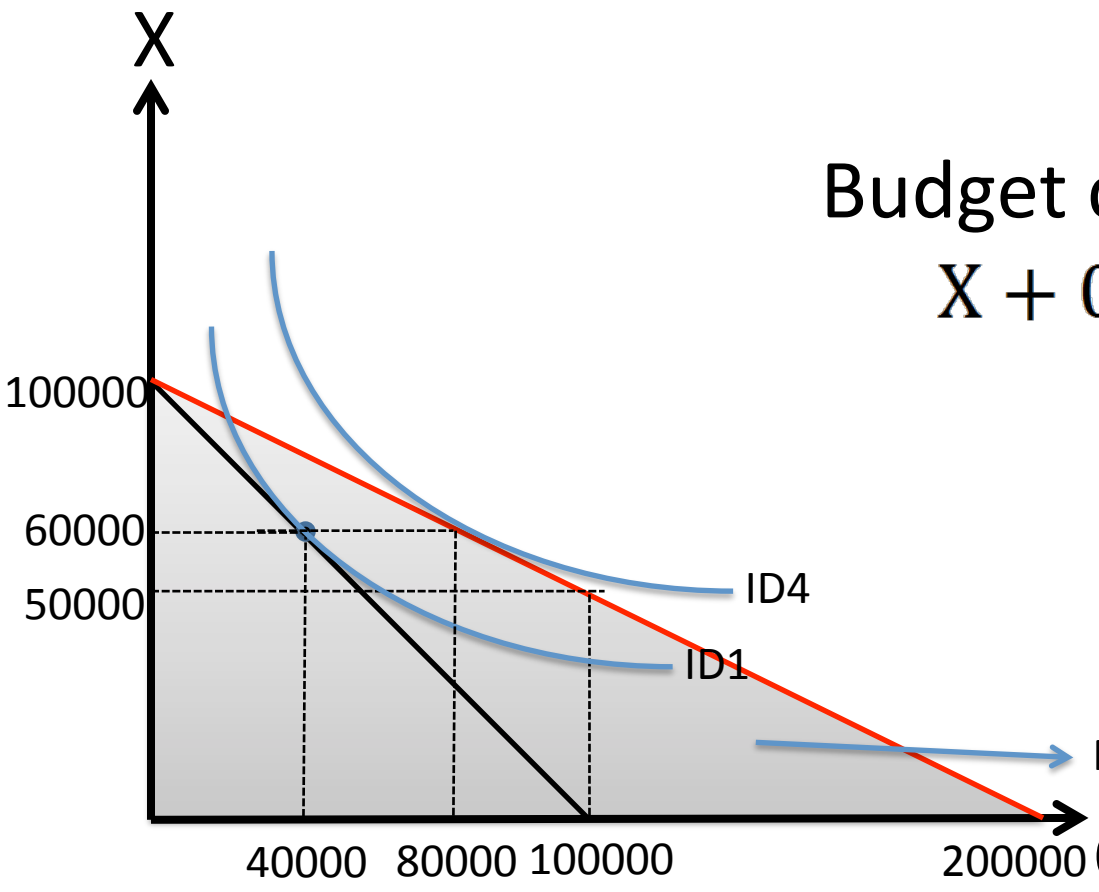
Budget constraint becomes

$$X + 0.5C = 100000, C < 100000$$

$$X + C = 150000, 100000 < C < 150000$$

Max grant possible = $50000

Plan C: Grant of $0.50 for every $1 spent on computer (Possibility 2)



Budget constraint becomes

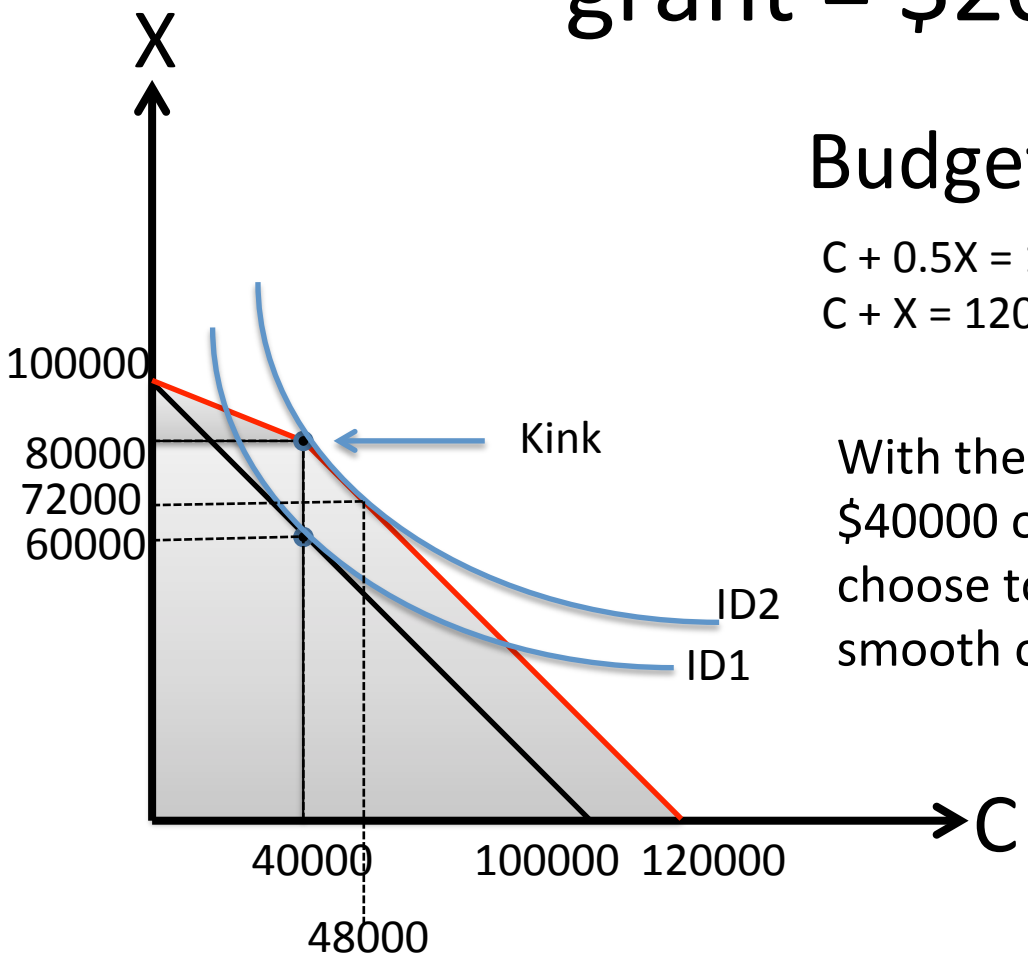
$$X + 0.5C = 100000$$

Max grant possible = $100000

Plan D

- Matching grant with upper limit ($20000)
- Any spending on computer beyond $40000 gets no matching grant
- Effectively halves the price of C until C = 40000
- Presence of kink

Plan D: same as plan C just that max grant = $20000



Budget constraint becomes

C + 0.5X = 100000, C < 40000
C + X = 120000, C >= 40000

With the grant of $20000 after spending $40000 on computers, the school can choose to spend it all on X or all on C or smooth out consumption.

Question 2

- Given $U = C^2X^3$, confirm that the headmaster will choose to spend $40000 on computers under the status quo.
- Calculate headmaster's spending under Plans A to D
- Which plan does headmaster prefer?
- Which plan minimises council spending?

Utility Maximisation Problem

- Budget constraint: C + X = 100000
- To maximize utility under the budget constraint, we need:
  - Negative slope of indifference curve (internal valuation ratio) = Negtative slope of budget line (price ratio)

$$\frac{MU_c}{MU_x} = \frac{2CX^3}{3C^2X^2} = 1$$

Utility Maximisation Problem

- By making X the subject, we obtain

$$X = \frac{3}{2}C$$

- Substitute back into budget constraint:

$$C + \frac{3}{2}C = 100000$$

$$C = 40000$$

X = 60000

Plan A

- Same price ratio as no plan so:

  $X = (3/2)C$

  Substitute into Budget Line,
  $2.5C = 120000$
  $C = 48000$
  $X = 72000$

  $U = (48000)^2(72000)^3$
  $U = 8.60*10^{23}$

  Council Spending = $20000

Plan B

- Headmaster will either spend at kink point or to its right (why?)

If he spends to the right,
$X = (3/2)C$ (Same price ratio)

Substitute into Budget Line,
$2.5C = 120000$
$C = 48000$
$X = 72000$

(48000, 72000) is not to the right!
Contradiction

If he spends at kink point,
$C = 60000$
$X = 60000$

$U = (60000)^5$
$U = 7.78*10^{23}$

Council spending = $20000

Plan C

- Both possibilities give same solution. Solving P1 will show this.

  $X = (3/4)C$ (Price ratio has changed!)

  Substitute into Budget Line,
  $1.25C = 100000$
  $C = 80000$
  $X = 60000$
  (80000, 60000) is to the left of the kink!

  $U = (80000)^2(60000)^3$
  $U = 1.3824*10^{24}$

  Council Spending = (0.50)*(80000) = $40000

Plan D

- Head master will either spend on the kink or to its right (Why?)
- Solution to Plan A tells us he will spend to the right of kink point at (48000, 72000)

$U = (48000)^2(72000)^3$
$U = 8.60*10^{23}$

Council Spending = $20000

Choices

- The headmaster will choose plan C to yield the highest utility of 1.3824×10^{24} .
- Plan A, B and D will minimise the council's expenditure and just cost council $20000. Plan C will cost council $40000.