Econ 200 AE Spring '25 Week 3

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Section Information / Reminders

Friday 11:30am, MOR 221.

Office Hours: Tue Thur 11am-12pm, SAV 403.

Weekly material posted on https://onirudh3.github.io/teaching.

Grading:

- Homework: 20% (lowest grade dropped), due every Thursday 11:59pm.
- Writing assignments: 20% (two 2 page assignments due May 1 and June 5).
- Midterm: 30% April 29.
- Final: 30% (non-cumulative) June 5.

Writing assignment guidelines:

- No more than 2 pages.
- Article must have been published since the beginning of 2025.
- Content should be related to what was talked about in class so far (trade, game theory, etc.).
- Need to include a graph, chart, table, or a payoff matrix created by you (cannot be pulled directly from the article).
- Please don't use AI to generate your work (check syllabus). If we believe you have let AI think for you, we reserve the right to significantly reduce your grade or give you a zero.

Unit 3 Review

Some important things to recall (not exhaustive):

- Feasible frontiers, indifference curves, constrained choice problems, income + substitution effects.
- Indifference curve – the set of different consumption bundles that give me the same utility. They have certain properties: smooth, downward sloping, never intersect, higher indifference curves correspond to higher utility levels, asymptotic. Equation of an IC could be

$$u(time, consumption) = time \times consumption$$

- Slope of IC is MRS. For example, the trade-off someone is willing to make between free time and consumption because they are both *scarce*.
- Feasible set – set of consumption bundles under the budget constraint, which also called the feasible frontier. Slope of feasible frontier is MRT (relative price). For example, it is the trade-off someone is *constrained* to make between free time and consumption. Equation for a feasible frontier could be

$$consumption = wage(24 - time)$$

  is linear and can be written as $y = mx + c$.
- Change in relative price of a good affects consumption due to an income effect – higher income implies higher consumption (shifts feasible frontier upwards), and a substitution effect – higher the opportunity cost implies less consumption.

Problems

1. You currently work for 40 hours a week at a wage rate of \$12 an hour. Your free hours are defined as the number of hours not in work, which in this case is

$$24 \text{ hours} \times 7 \text{ days} - 40 \text{ hours} = 128 \text{ hours per week}$$

   Suppose that you are happy to keep your total weekly income constant.

i. If your wage rate increases to \$16 an hour, what will the increase in your free time be?

$40 \cdot 12 = 480$ weekly income

$h \cdot 16 = 480$

$\Rightarrow h = 30$ $\therefore$ increase in free time

$= 40 - 30 = 10$ hrs

ii. If you want to have 12.5% more free time, how much do you need to increase your wage rate (relative to \$12)?

$128\ (1.125) = 144$

$168 - 144 = 24$

$24 \cdot w = 480 \Rightarrow w = 20$ new wage

$\therefore$ wage must $\uparrow$ by $\frac{20}{12} = 66\%$.

iii. How many free hours would you have if your wage was cut by 25%?

$12(1 - 0.25) = 9$

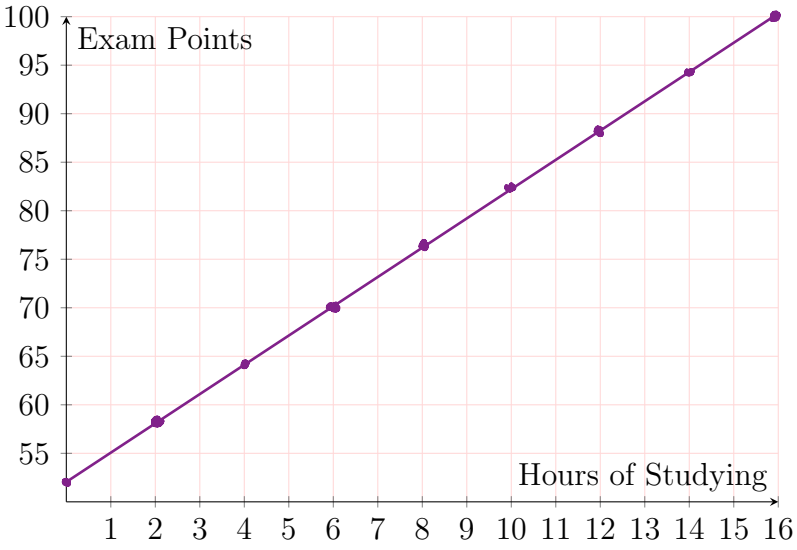
$9 \cdot h = 480 \Rightarrow h = 53.\overline{3}$

$\therefore$ Free hours $= 168 - 53.\overline{3} \approx 115$

2. Imagine you have 16 hours per day for either relaxing or studying for our upcoming economics exam. The table below shows your production function for exam points, based on hours of studying.

Hours Worked	0	2	4	6	8	10	12	14	16
Exam Points	52	58	64	70	76	82	88	94	100

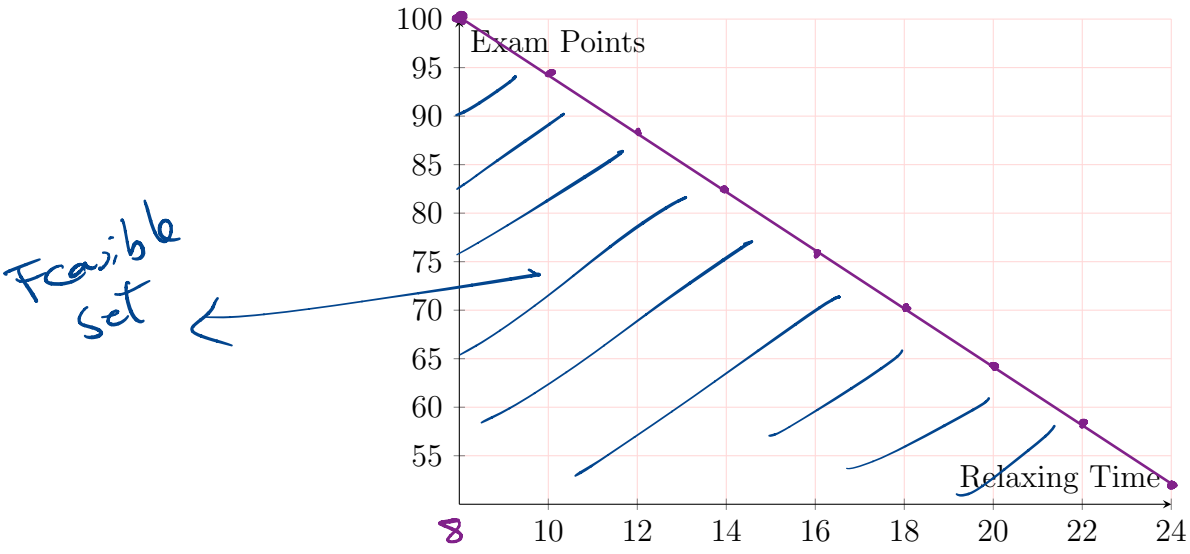
i. Draw your production function on a graph with hours of studying on the x-axis and exam points on the y-axis. What is the y-intercept?



ii. What is your marginal product of an hour spent on studying? Can you show how to identify this on a graph?

$$\text{slope} = \frac{58 - 52}{2 - 0} = 3 \text{ points}$$

iii. Now draw a new graph with relaxing time on the x-axis and exam points on the y-axis. Draw your feasible set of these two goods on this graph, based on the table above and the total amount of time you have in your day.



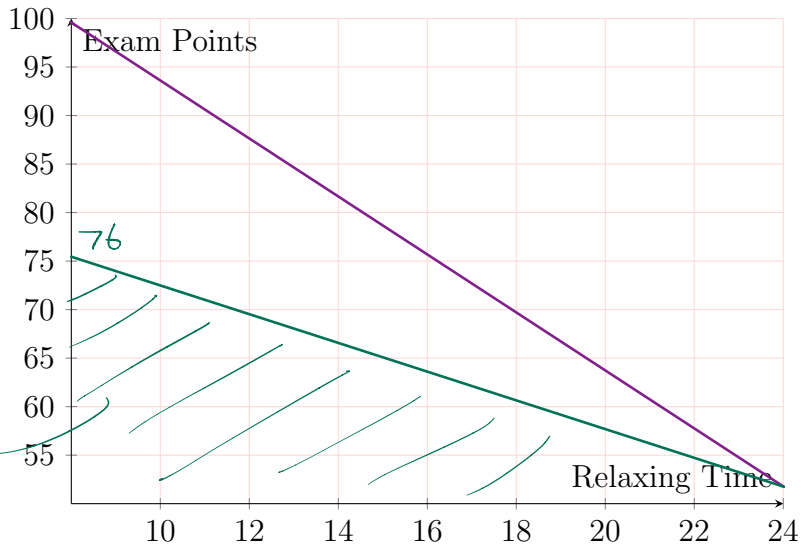
iv. What is the marginal rate of transformation between relaxing and exam points?

MRT = slope of feasible frontier

$= \frac{100-52}{8-24} = \frac{-48}{16} = -3$ points

v. Let's say you come down with a cold, making studying harder. The marginal product of time spent studying from ii. is cut in half. Can you show what happens to your feasible set?

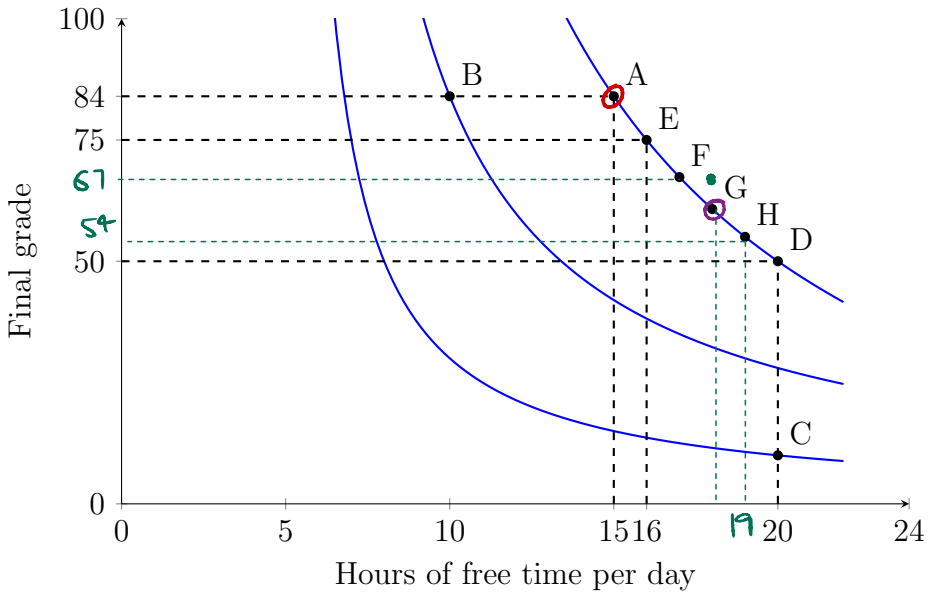
slope halves
⇒ spending all time studying gives me $\frac{100-52}{2}$ points



new feasible set

3. The figure shows the indifference curves of a student for the two 'goods', free time and final grade. Based on the information, answer the questions below.

	A	E	F	G	H	D
Hours of Free Time	15	16	17	18	19	20
Final Grade	84	75	67	60	54	50



i. How many points is the student willing to give up for 2 extra hours of free time if they are currently at A? How about if they are at G?

A → F : 84 − 67 = 17 points

G → D : 60 − 50 = 10 points

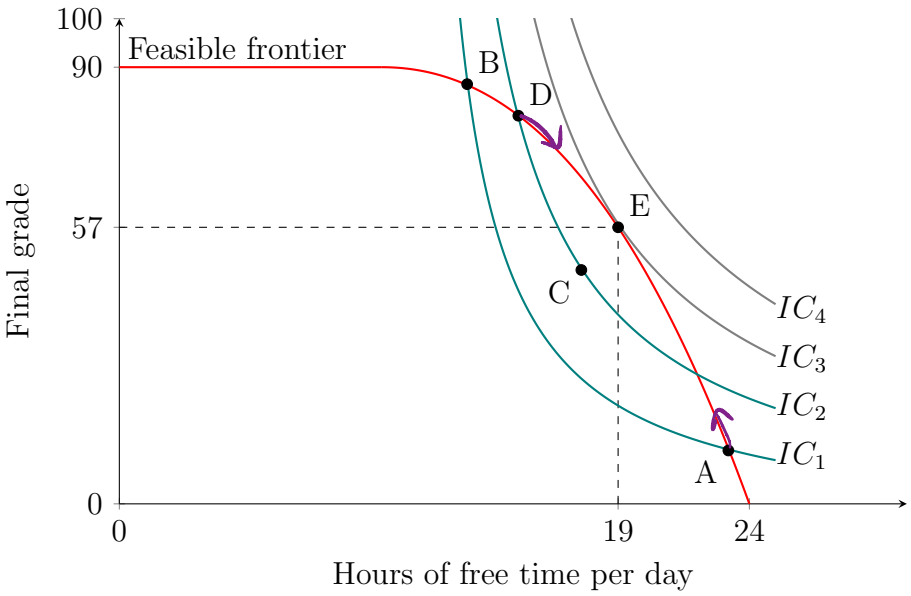
ii. Is A preferred to B? Why?

Yes. A is on a higher IC.

iii. Which does the student prefer, a grade of 54 with 19 hours of free time or a grade of 67 with 18 hours of free time? Why?

Prefers the latter because it's on a higher IC.

4. The figure shows a student's feasible frontier and her indifference curves for final exam marks and the hours of free time per day. The table also gives the marginal rate of substitution (MRS) and the marginal rate of transformation (MRT) for the points shown in the figure.



	B	D	E	A
Free time	13	15	19	22
Grade	84	78	57	33
MRT	2	4	7	9
MRS	20	15	7	3

feasibility →
willingness →

i. At A, how many extra points would the student need to gain on the test to be willing to give up 1 hour of free time? How many points would she actually gain if she increased her studying time by 1 hour? Should she study more?

$3 < 9$ ∴ yes she should study more.

ii. At D, how many points would the student be willing to give up to have 1 more hour of free time? How many points would she actually lose if she cut her studying time by 1

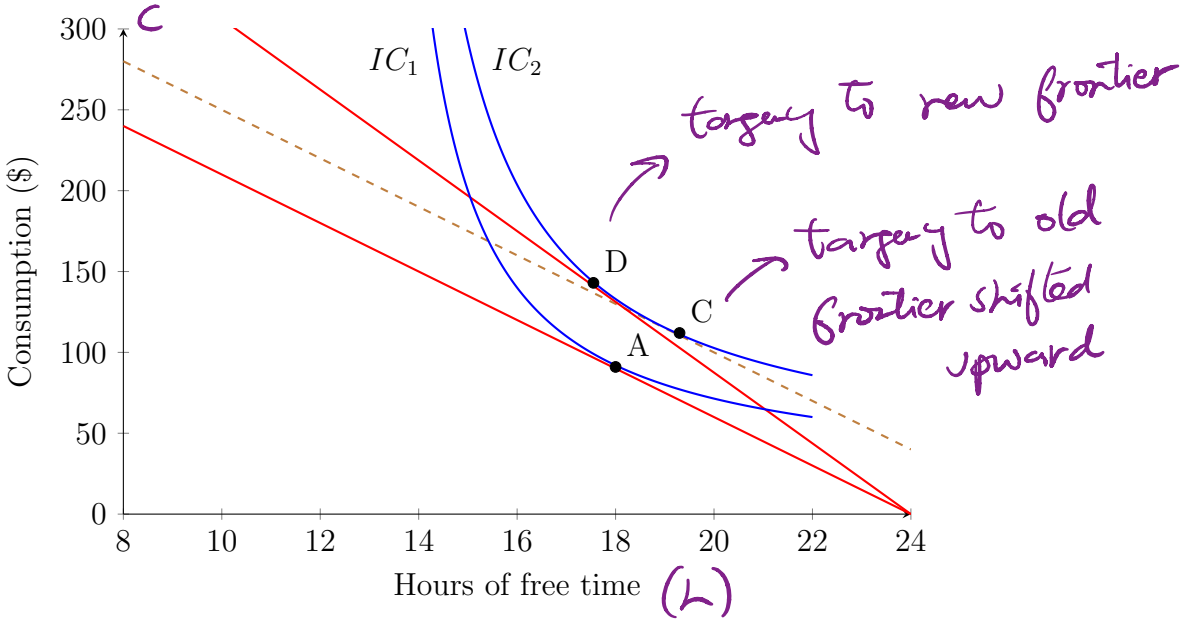
hour? Should she study less?

15 > 4 ∴ Yes she should study less.

iii. At E, the MRS matches the student's MRT. Explain why this is the student's optimal choice.

7=7. Any deviation from this point is suboptimal.

5. The following diagram depicts the effect of the change in wage level on a worker's choice of consumption and hours of free time. The choice before and after the wage rise are given by A and D, respectively.



i. Write the equation for the feasible set. How did the worker's MRT change when the

MRT = −w

wage changed? consumption = wage × hours worked

$c = w(24-h) \quad h \geq 8$

$\Rightarrow c = -wh + 24w$ (slope ↑ if w ↑)

y = mx + c

ii. Does the change in the choice from A to C represent the substitution effect or the income effect?

Income effect

iii. Does the change in the choice from C to D represent the substitution effect or the income effect?

Substitution effect

iv. Is the MRT at D higher / lower / the same as it is at A?

MRT = −w ∴ higher.

v. Is the MRS at C higher / lower / the same as it is at A? same.

6. Imagine that you are offered a job at the end of your university course with a salary per hour (after taxes) of £12.50. Your future employer then says that you will work for 40 hours per week leaving you with 128 hours of free time per week. You tell a friend: 'at that wage, 40 hours is exactly what I would like.'

   i. Draw a diagram with free time on the horizontal axis and weekly pay on the vertical axis, and plot the combination of hours and the wage corresponding to your job offer, calling it A. Assume you need about 10 hours a day for sleeping and eating, so you may

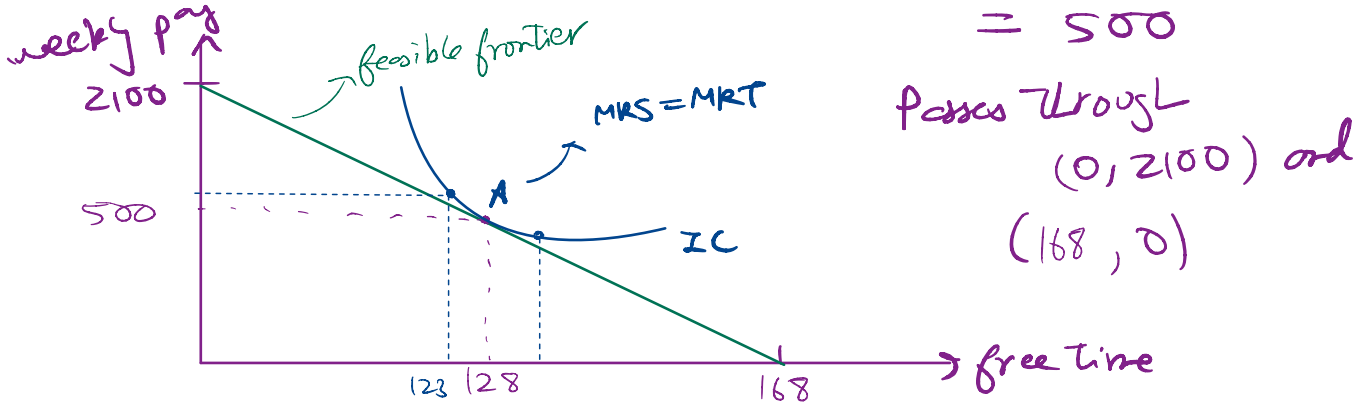
work all the time: 168 · 12.5 = 2100

doesn't work :

weekly pay = 40 × 12.5 = 500

Passes through (0, 2100) and (168, 0)

want to draw the horizontal axis with 70 hours at the origin.



ii. Now draw an indifference curve so that A represents the hours you would have chosen yourself. In blue.

iii. Now imagine you were offered another job requiring 45 hours of work per week. Use the indifference curve you have drawn to estimate the level of weekly pay that would make you indifferent between this and the original offer.

128 − 5 = 123 hrs free time

Vertical axis value of IC at 123 hrs

iv. Do the same for another job requiring 35 hours of work per week. What level of weekly pay would make you indifferent between this and the original offer?

128 + 5 = 133 hrs of free time.

Vertical axis value of IC at 133 hrs

v. Use your diagram to estimate your marginal rate of substitution between pay and free time at A. MRS = MRT at A, so MRS = −12.5

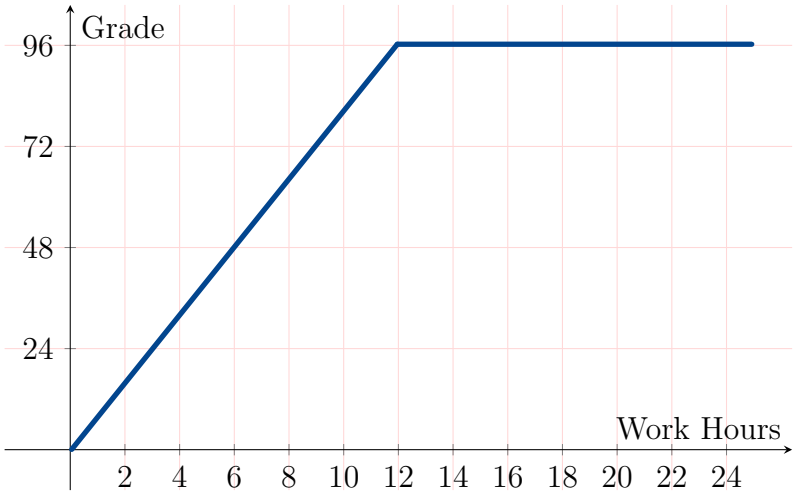
7. Consider the situation of Alexei, a student, who knows that his final grade from the course will depend on the average number of hours he works in a day. If he does no work, his grade will be zero. For each hour that he works, his grade will increase by 8 percentage points, up to a maximum of 12 hours per day. After that, more work will not raise his grade any further.

i. Suppose that the only things Alexei cares about are his final grade, and his free time.

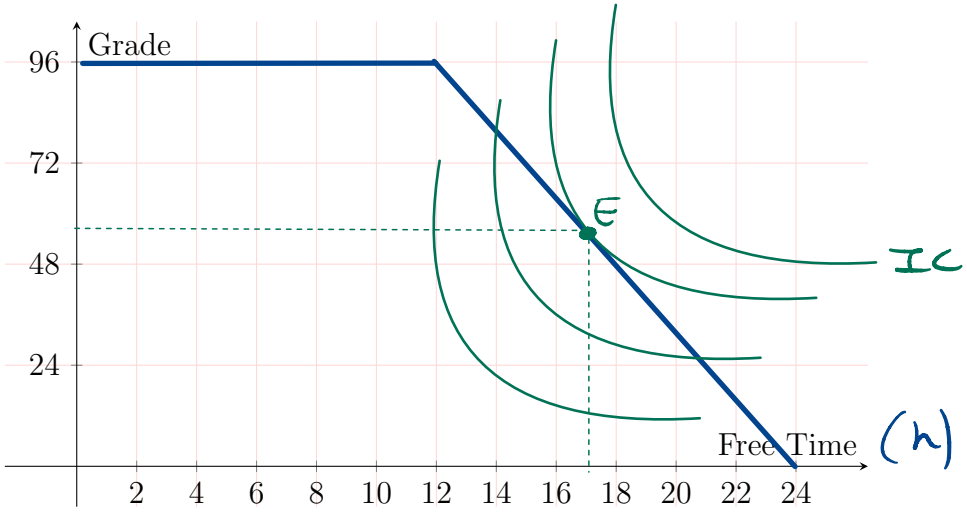
Are these two goods scarce for Alexei? Explain.

Yes. B/c there is a trade-off.

ii. Draw a graph showing how Alexei's grade depends on his hours of work (with work hours on the horizontal axis).



iii. In a diagram with hours of free time on the horizontal axis and grade on the vertical axis, sketch indifference curves to represent Alexei's preferences, assuming as before that they are downward sloping and become flatter as free time increases.



iv. Add Alexei's feasible frontier and feasible set to the diagram. (Hint: it should be the mirror image of the graph in part ii.) What is his marginal rate of transformation

between free time and grade points?

$h < 12 \Rightarrow MRT = 0$

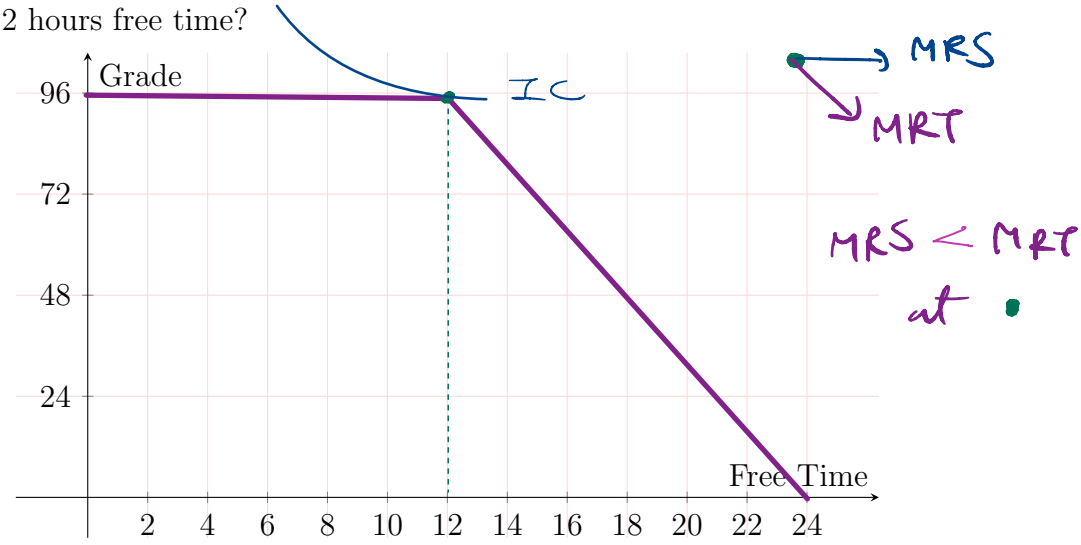
$h \in (12, 24] \Rightarrow MRT = -8$

$h = 12 \Rightarrow$ MRT is undefined

v. Mark Alexei's preferred choice on your diagram. (your answer will depend on how you have drawn the indifference curves). How many hours a day does he choose to work?

E is preferred choice (point of tangency)

vi. Draw another set of indifference curves (using a separate diagram) to show that Alexei's preferences could lead him to choose exactly 12 hours of free time per day, and that in this special case, his MRS could be less than his MRT. Would he ever decide to have less than 12 hours free time?



Never will have less free time for achieving the same grade!