

**Econ 301: Assignment 1–Solutions**  
Instructor: Szilvia Pápai, Concordia University

*Graphs are attached at the end.*

1. a. FALSE. If both the prices and income decrease by half, then the budget set is not affected at all. The set from which the consumer can choose her consumption bundles remains the same. Thus, she is just as well off as before the change.
- b. FALSE. Suppose that two indifference curves, curve 1 and curve 2, cross at consumption bundle  $Z$ . Suppose that consumption bundles  $X$  and  $Z$  are on indifference curve 1, and consumption bundles  $Y$  and  $Z$  are on indifference curve 2. Since  $X \sim Z$  and  $Z \sim Y$ , we have  $X \sim Y$ , by transitivity, which leads to a contradiction since  $X$  and  $Y$  represent different levels of preference.
- c. TRUE. A convex set has the property that if you take any two points in the set and draw the line segments connecting those two points, the line segment lies entirely in the set. If we take any two bundles on an indifference curve and take their weighted average then this average bundle is (weakly) preferred to the two original (extreme) bundles if the indifference curve is convex, which means exactly that preferences are convex. Thus, convex preferences mean that averages are preferred to extremes.

2. a. The budget constraint is

$$5x_1 + 20x_2 \leq 400.$$

The budget line is a straight line with horizontal intercept  $\$400/\$5 = 80$  and vertical intercept  $\$400/\$20 = 20$ . The budget set is the triangle area between the budget line and the two axes.

- b. Now, the consumer has to pay a price of  $p'_2 = 20(1 + 0.25) = 25$  for a CD. The budget constraint is

$$5x_1 + 25x_2 \leq 400.$$

The budget line has the same horizontal intercept as before, 80, since  $p_1$  did not change, while the vertical intercept is now  $\$400/\$25 = 16$ .

- c. This means that the consumer now only has a monthly income of  $\$300$ ; the budget line shifts inward. The budget constraint is

$$5x_1 + 20x_2 \leq 300.$$

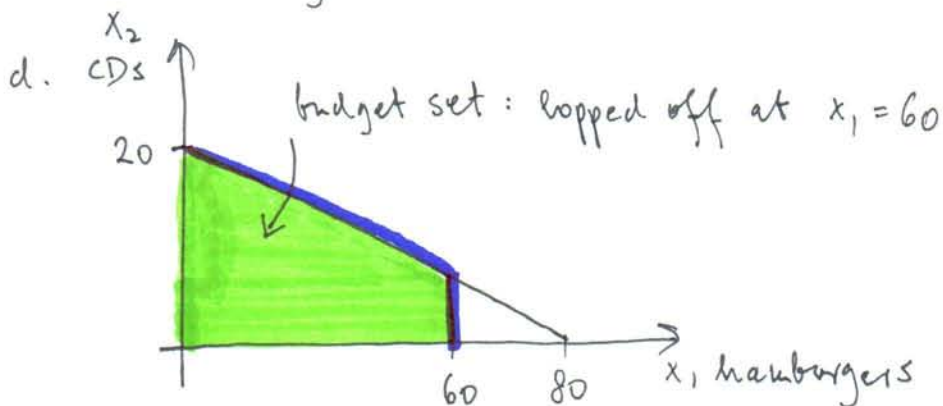
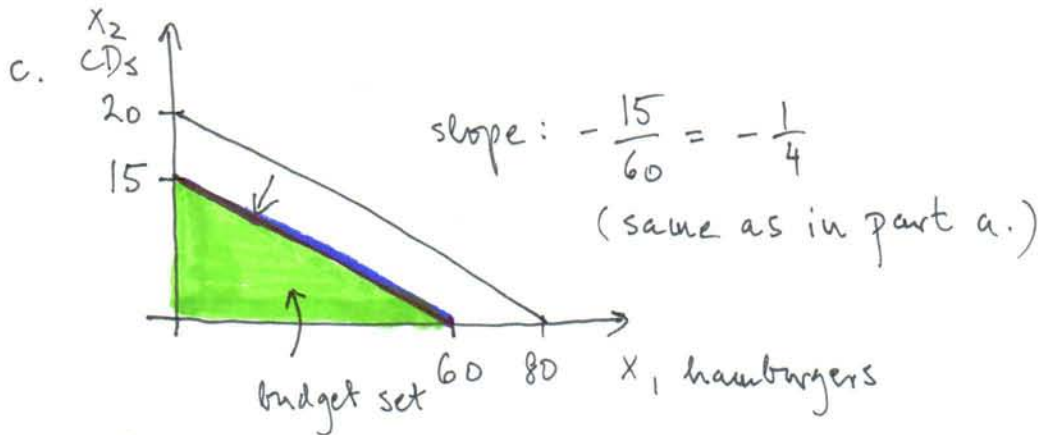
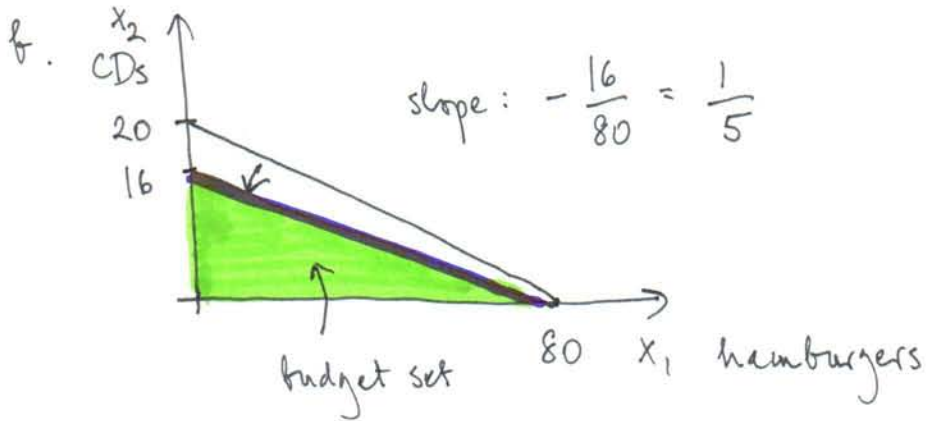
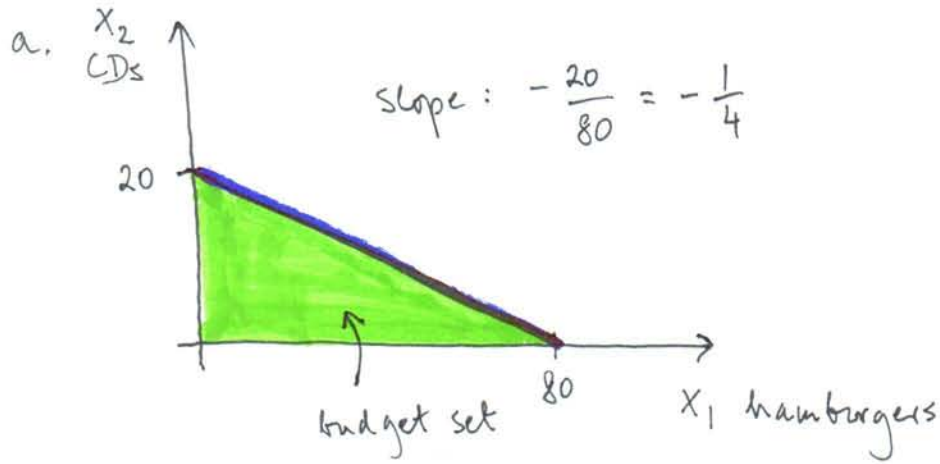
- d. Hamburgers are rationed: the maximum amount consumed is 60 hamburgers, so the budget set is lopped off beyond  $x_1 = 60$ , but otherwise the budget constraint is the same as before.

3. a. The goods are improvement in philosophy grade (good 1) and improvement in mathematics grade (good 2). The prices represent the number of hours Art has to spend in order to improve his grade by one point. Thus,  $p_1 = 1$  and  $p_2 = 2$ . The income is the number of hours Art has to spend on studying for the two subjects. Therefore,  $m = 40$ . Hence the budget constraint is

$$x_1 + 2x_2 \leq 40.$$

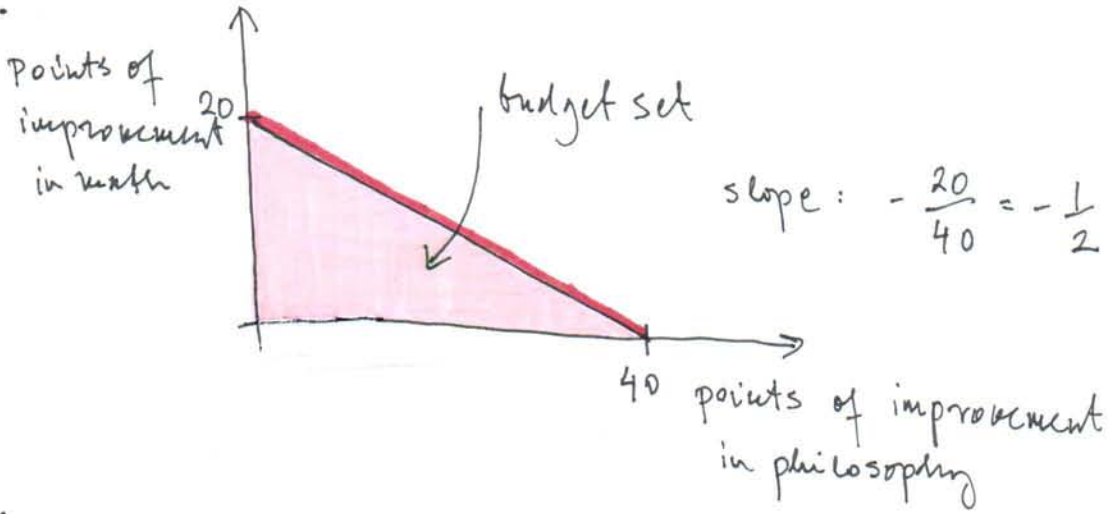
- b. Since Art can get 50 points on each subject without any studying, he has to "consume" at least 10 units of each good in order to obtain 60 points on each subject; that is, he has to spend at least 10 hours studying each subject. Thus, his new budget set is the triangle formed by the budget line, the vertical line  $x_1 = 10$ , and the horizontal line  $x_2 = 10$ .
4. a. Yes, it is transitive: if person  $A$  is at least as old as person  $B$ , and person  $B$  is at least as old as person  $C$ , then person  $A$  is at least as old as person  $C$ . Yes, it is complete. For any two persons  $A$  and  $B$ , we can determine whether  $A$  is at least as old as  $B$ , or  $B$  is at least as old as  $A$  (or perhaps both, if  $A$  and  $B$  are exactly the same age).
- b. Yes, it is transitive: if person  $A$  is older than person  $B$ , and person  $B$  is older than person  $C$ , then person  $A$  is older than person  $C$ . No, it is not complete:  $A$  and  $B$  may be exactly the same age.
5. a. E.g.,  $(6, 1)$ ,  $(4, 2)$ , etc.; when the number of bananas consumed goes down by 2, the number of mangoes goes up by 1, in order for Jon to stay on the same indifference curve.
- b. See the attached sheet with graphs.
- c. The MRS is a constant  $-1/2$ . Bananas and mangoes are perfect substitutes for Jon. These indifference curves do not exhibit a diminishing marginal rate of substitution; they are constant.
- d. Yes, the preferences are monotonic: more of both goods is better (i.e., both goods are *goods*, not *bads*), and thus the indifference curves have a negative slope.

# Question 2 graphs

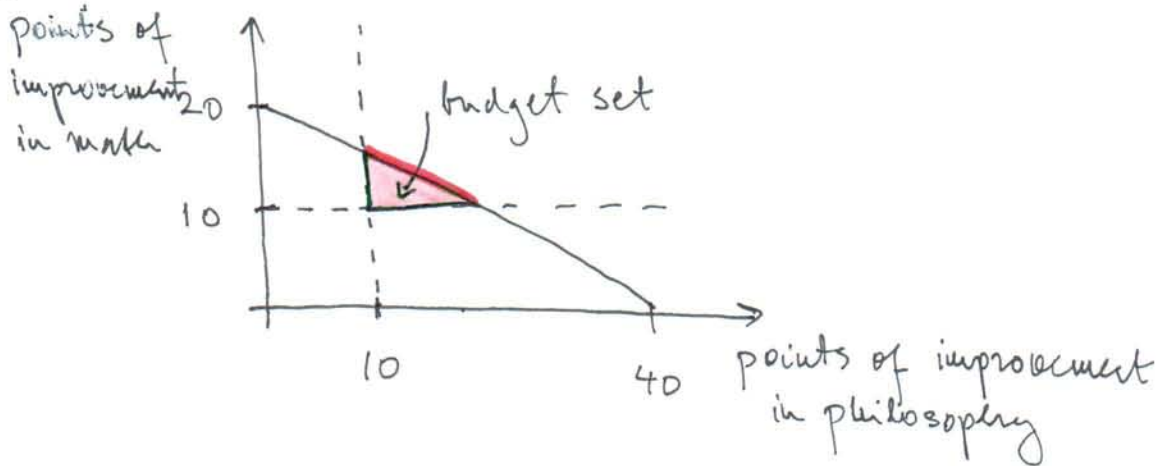


### Question 3 graphs

a.



b.



### Question 5 graph

b.c.  $X_m$  mangoes

