ECON 101, Problem Set 1
Due Tuesday, June 7

1. Suppose there are two "goods", x and y, and your utility function is

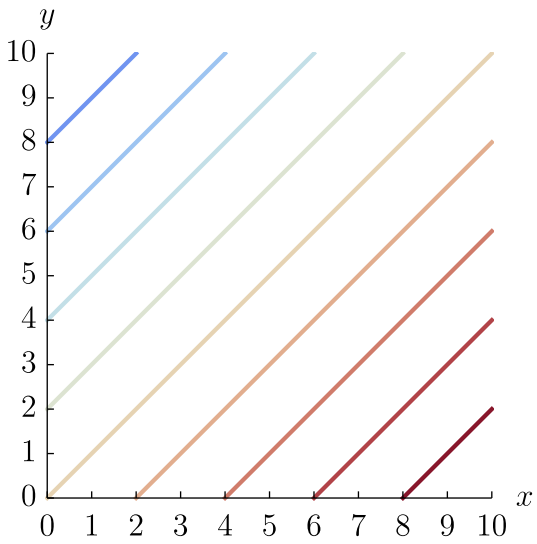
$$u(x, y) = x - y$$

   (a) In 1-2 sentences, how would you interpret good y given how it enters the utility function?

   Solution: Good y is, in fact, not very good at all, as utility is decreasing in it. It is something you do not want to have, perhaps foul-smelling garbage.

   (b) Draw indifferences curves (in (x, y)-space) for these two goods, and an arrow pointing in the direction in which utility is increasing.

   Solution:



   The arrow would point towards the bottom right, perpendicular to the indifference curves. I've shown it with the colors instead.

   (c) Supposing $p_x = 2$, $p_y = 1$ and $w = 10$, you cannot save money, and you can't purchase negative quantities, how many units of x and y would you choose to buy?

   Solution: You would not consume any of good y because it costs money and gives negative utility. Instead, you spend all of your income, $w = 10$, on x, meaning you purchase five units of x.

2. Suppose you are from Astana and you have a job that pays \$27,000 per year in Astana. You are offered a job in Almaty that pays \$30,000 per year.

   (a) What is the monetary opportunity cost of working in Astana?

   Solution: \$30,000

   (b) Would you take the job in Almaty?

   Solution: It depends on how much you value living in Astana. If you prefer living in Astana to \$30,000 \$27,000 = \$3,000, you will take the job in Astana. However if anything less than \$3,000 (say \$1,000) will make you indifferent between living in Astana and Almaty, you will take the job in Almaty.

(c) Suppose you have not taken the job in Almaty. What is the lowest value (in dollars) that the non-monetary benefits of working in Astana could have (given this decision)?

Solution: The lowest is $3,000.

3. For each of the following statements, determine whether the statement is *positive* or *normative*. Briefly explain your answer.

(a) By the end of the year Joe's savings from his work should be sufficient to pay for a year of college tuition.

Solution: Positive, because it is a statement about a verifiable fact, i.e., what is and what will be. The word *should* here may have confused you if you said normative. *Should* is often used in normative sentences, but it has another probabilistic meaning, which it is clear from context here, where it means more like *it is likely.*

(b) Susie should get more sleep.

Solution: Normative, because it is an opinion on what ought to be.

(c) The government should cut taxes on the rich.

Solution: Normative, because it is an opinion on what ought to be.

(d) Cutting taxes on the rich will benefit the poor through "trickle down" economics.

Solution: Positive, because, again, it is a statement about what is / will be. Note that positive statements need not be true – many would disagree with this particular positive statement, but that doesn't mean that it isn't positive in nature.

4. Suppose there are three alternatives (a, b, c) and Dave the deer's entire preferences are:

$$a \succ b, \qquad b \succ c$$

(a) Why can we say that Dave is not rational?

Solution: To be rational, your preferences must be complete and transitive. These preferences are not complete as there is no comparison between a and c.

(b) Add an additional comparison that would make Dave rational.

Solution: You could add $a \succ c$ and his preferences would be complete and transitive.

(c) Returning to the original preferences (discarding your addition), what other addition could you make such that Dave would remain irrational?

Solution: I'm hoping you put $c \succ a$. This would make his preferences complete but intransitive, and hence not rational. I suppose you could also have put directly contradictory things like $b \succ a$ and those are also valid answers to this question.

5. Suppose you have utility function $u(x, y) = \min(x, 2y)$.

(a) To what broad category of utility functions that we've already studied are these related?

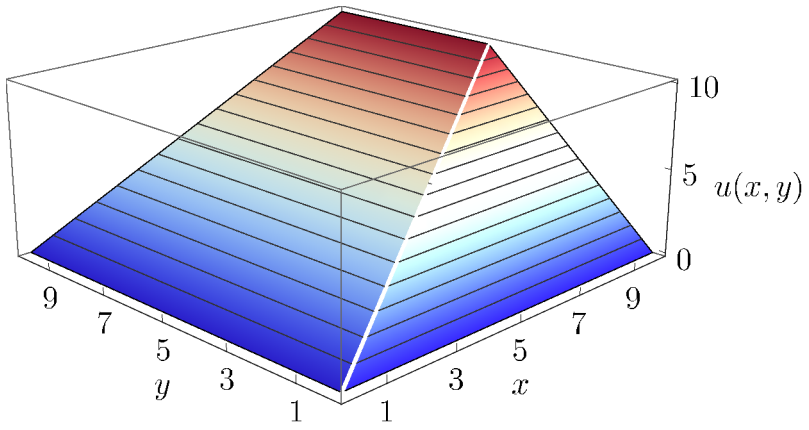
Solution: Perfect complements. It still has the minimum function, but now instead of needing the two goods in a 1:1 ratio, you need them in a 2:1 ratio. That is, since $x = 2y$, you optimally have 2 units of x for every unit of y. We would still call these two goods perfect complements, using a slightly generalized definition of what I gave in class. Similarly, $u(x, y) = x + 10y$ would still be called perfect substitutes. Maybe x is a slice of bread and y is a 10-slice loaf.

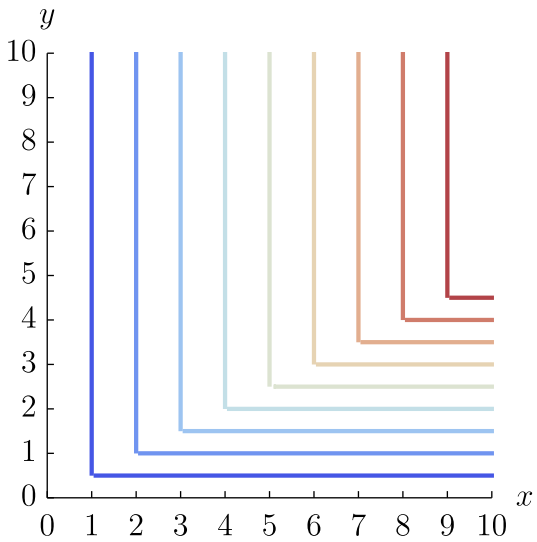
(b) Give an example of two goods for which one might have this utility function.

Solution: You could come up with a bunch of things. One example would be if x is bicycle tires and y is a bicycle. Obviously you need two tires with each bike.

(c) Draw indifferences curves (in (x, y)-space) for these two goods.

Solution: I'll give you the utility plot also, in case you're interested. Here's both:





You'll notice it looks a lot like the perfect complements indifference curves except the kink in each indifference curve is along the $y = x/2$ ray instead of the $y = x$ ray.

6. Suppose $p_x = 6, p_y = 3, w = 24$.

(a) Find the formula for the budget constraint.

Solution: Remember that the budget constraint is:

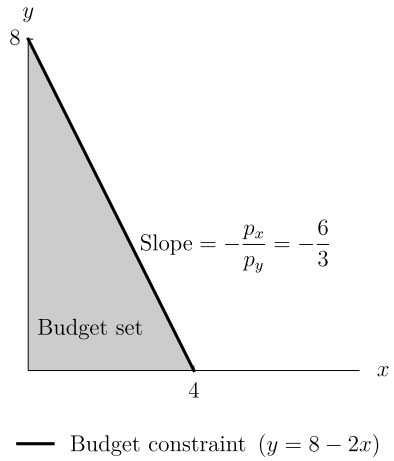
$$p_x \cdot x + p_y \cdot y \leq w.$$

And to represent it, we set it to equality and solve for y then plot:

$$\begin{aligned} 6 \cdot x + 3 \cdot y &= 24 \\ y &= 8 - 2x \end{aligned}$$

(b) Show and label the budget constraint, its slope, and the budget set in (x, y)-space.

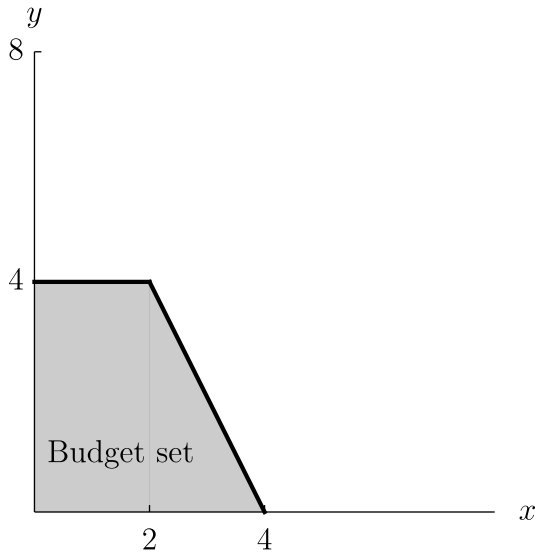
Solution:



(c) Now show the new budget set for each of the following scenarios:

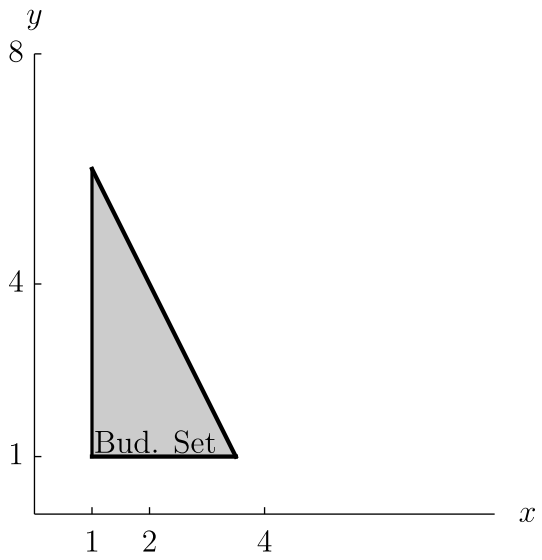
i. y is rationed by the government so that you may purchase at most 4 units of it.

Solution:



ii. The government stipulates that you must buy at least one unit of each good.

Solution:



iii. There is a bulk discount on x. Once you've brought two units at full price, additional units cost just 3.

Solution: