Notes on the Economics 501B Midterm Exam
University of Arizona
Fall 2015

1. This problem was apparently more difficult than I thought, even though it involved only two consumers, two goods, and preferences that were completely nice except that they were only weakly quasiconcave. Actually, I think it *is* easy; but perhaps it appeared to everyone that it was even easier than it actually is, leading to mistakes.

(a) Nearly everyone did obtain the correct Pareto set, which was the most important thing about part (a). The problem also asked you to "indicate how you can tell from the marginal conditions ...". No one did that. Most everyone *stated* the marginal condition — that because $MRS_A > MRS_B$ everywhere, no interior allocation can be Pareto efficient — but no one said anything about *why* this follows from $MRS_A > MRS_B$. (This was a minor omission.)

(b) The Second Welfare Theorem tells us that Pareto allocations can be supported as market equilibria if we're allowed to first transfer some resources or wealth. It doesn't say anything about *non*-Pareto allocations. But the First Welfare Theorem does: it says that if the preferences are LNS, then only Pareto allocations can be Walrasian equilibria. No non-Pareto allocation can be a market equilibrium. This of course assumes no externalities, everyone is a price-taker, etc. Very few people got this correct.

(c) and (d) While I didn't expect you to draw diagrams of A's and B's maximization problems, doing that would surely have helped you avoid the mistakes that occurred in parts (c) and (d). I can't emphasize enough that although you're learning things at a pretty general, high level in all the program's courses, you really understand it only by working with simple examples and, whenever possible, drawing diagrams. If you draw A's (or B's) budget constraint at a given price-ratio and one of her indifference curves, it's easy to see that unless the price-ratio is 1 or 3, each will spend all of her budget on only one of the goods; and that if the price-ratio *is* 1 or 3, then *one* of the consumers will spend all her budget on only one good. This is a good check on whether your solution is correct. It would have made clear when there is excess supply or demand.

(d) The diagram for Bev would make it obvious that if $p_x/p_y > 1$ Bev will demand too little of the x-good ($x_B = 0$) and too much of the y-good for markets to clear; and if $p_x/p_y < 1$, both consumers will choose $y_i = 0$ and buy only the x-good, so again markets won't clear. Equilibrium prices therefore have to satisfy $p_x/p_y = 1$. Lots of people said the price-ratio is greater than 1; some said less than 1.

2. (a) Determining the Pareto allocations by formulating the P-Max problem and obtaining the FOMC was very straightforward — and quite easy for the utility functions in this problem. A few people used prices in answering part (a); see the comment below, in #3.

(b) The Walrasian equilibrium is also straightforward (it's the same as without the externality, as in #1(c),), but it's *not* Pareto efficient, which seems to have led almost everyone astray. The key point here is that in a market setting each consumer just chooses his or her own bundle, so as to maximize his or her utility, subject to market prices. She doesn't get to choose someone else's consumption (at least not via the market; but see the mention of gifts, below). The one thing that could make x_B relevant for Amy's decision is if Amy's MRS_A — the trade-off she's willing to make between the two goods — is affected by x_B. In that case, she still can't make x_B larger or smaller by her decision; but the decision about which bundle she should buy, at given prices, would be affected by x_B. However, in this problem Amy's MRS_A is *not* affected by x_B. So facing her budget constraint, she chooses the bundle (x_A, y_A) that maximizes her utility within her budget; the fact that she cares about x_B doesn't affect the only decision she gets to make. (If Amy could give some flowers to Bev as a gift, we would want to include that in our analysis, and it might change things. But for the exam I said "no gifts," and fortunately no one then considered gifts. You can see how this would complicate things: each person, when making her own decision, would have to take into account how many flowers *for Bev* the other is choosing.)

3. (a) Some people said that Pareto allocations are the ones for which $MRS_A = MRS_B$. But u_B in this problem is not differentiable — there is no MRS for u_B. However, it's easy to see directly that x_B has to be equal to y_B for Pareto efficiency: otherwise there are obvious Pareto improvements. A few people, here and also in #1 and #2, used prices when setting up the problem of finding Pareto allocations. I've emphasized in class, more than once, that the notion of Pareto efficiency is independent of markets and prices — it does not involve prices. So-called shadow prices, or efficiency prices, do *emerge* from Pareto allocations, but that is a kind of by-product, it's not part of the definition or in any way essential to the Pareto concept — or to any notion of efficiency that doesn't assume to begin with that we have to use markets.

(b) The utility frontier here was much easier to obtain than in our Cobb-Douglas examples. But it has to be an equation in u_A and u_B; the equation can't also include the x and/or y variables. Quite a few people stumbled on that last point.

Most people did OK on (c), (d), and (e).