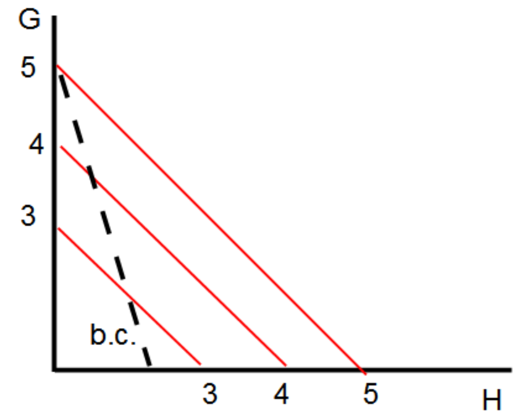
Name and Student ID: ______________________________

Due 24 Nov 2015. Turn in these (or other) pages stapled.
(Staples can be bought in class for cookies.)

1. Bob and Nob go to a club. Nob enjoys Heineken and Grolsch equally, i.e., $U_n = h + g$.

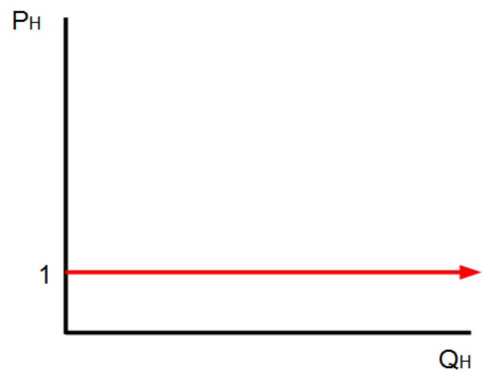
   (a) (1 point) Draw Nob's indifference curves for utilities equal to 3, 4 and 5 "utils" from consuming combinations of these beers. (Assume 1 util = €1.)

   Solution:

   (b) (1 point) Use Nob's marginal utility from Heineken to draw his demand curve. Label all important parts of the plot.

   Solution:
   Trust the stated economics (i.e., utility rises by one for each beer... no decreasing marginal utility), not what's most commonly the case.

   (c) (1 point) Grolsch is on sale, €1 per cup. Heineken is €2 per cup. How much of each beer does Nob drink if he has €5? *Also* show this on Nob's indifference curves (above).

   Solution:
   Demand curves are the same for both beers, i.e., drink infinite beer (no decrease in marginal utility). Thus, he will spend all his money on beer and

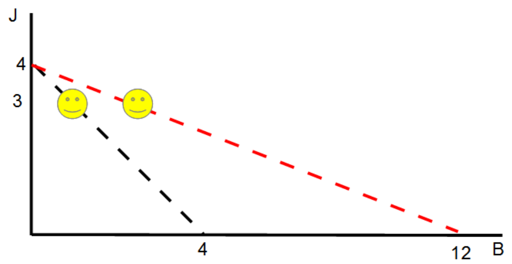
Grolsch here ($G = 5$, $H = 0$) because it's cheaper. Several people forgot to put the budget constraint.

(d) (1 point) Bob has to drive both of them home later that night, and he knows that Nob has a drinking problem. Nob forgot his wallet, so he asks Bob for some money. Bob is talking to a cute girl who's there with some friends. Should Bob leave the conversation to get change (so he can give Nob less than €50) or should he trust that Nob will be responsible with €50? Explain Bob's choice.

Solution:
Lots of interesting scenarios. In most case, people got full credit for a decent discussion of costs and benefits. "Nob is a nice guy" so he won't drink all teh money and throw up didn't work.
Bob will go get change (perhaps asking the girl to accompany him on this romantic task) because he knows that Nob will drink all his money, get drunk and probably throw up, causing him much great utility losses than the cost of getting change.

2. (a) (1 point) You like to drink and eat while you watch football at Pub Jupiter, but you can only afford to spend €12.
Draw your "budget constraint" for Jupiter (vertical axis) and bitteballen (horizontal axis) when they cost €3 (each) and €3 (per serving), respectively.

Solution:



(b) (3 points) You like Jupiter more than bitteballen but always together, i.e, $U(j, b) = j^{\frac{3}{4}} b^{\frac{1}{4}}$. Use the Lagrangian method to calculate your utility maximizing consumption on a normal night at the pub. Show all your steps, double check you can afford your final consumption, AND calculate your utility.

Solution: NB: The Lagrangian method helps organize the data to get to a solution. Several of you got confused using other, "faster" methods.

$$\max U(j, b) = j^{\frac{3}{4}} b^{\frac{1}{4}} \text{ s.t. } 12 \geq 3j + 3b$$

$$\mathcal{L} \quad : \quad j^{\frac{3}{4}} b^{\frac{1}{4}} + \lambda(12 - 3j - 3b)$$

$$\frac{\delta \mathcal{L}}{\delta j} \quad : \quad \frac{3}{4} j^{\frac{-1}{4}} b^{\frac{1}{4}} - 3\lambda \overset{\text{set}}{=} 0$$

$$\frac{\delta\mathcal{L}}{\delta b} \quad : \quad \frac{1}{4} j^{\frac{3}{4}} b^{\frac{-3}{4}} - 3\lambda \overset{\text{set}}{=} 0$$
$$\frac{\delta\mathcal{L}}{\delta\lambda} \quad : \quad 12 - 3j - 3b \overset{\text{set}}{=} 0$$

Now do some algebra to find b as a function of j using λ, i.e., $\frac{1}{12}(j^{\frac{3}{4}} b^{\frac{-3}{4}}) = \frac{1}{4}(j^{\frac{-1}{4}} b^{\frac{1}{4}}) \rightarrow$ (via multiplying both sides by $j^{\frac{1}{4}} b^{\frac{-1}{4}}$) $\rightarrow \frac{1}{12} j = \frac{1}{4} b \rightarrow j = 3b$. Using this “optimal” ratio of j to b with the budget constraint, we get $12 = 3(3b) + 3b = 12b \rightarrow b = 1$ and $j = 3$ and utility of $3^{\frac{3}{4}} 1^{\frac{1}{4}} = 2.28$.

Double check: €12 = €3(3) + €3(1)

(c) (2 points) Your team is leading in the league and the pub celebrates by lowering the price of bitteballen to €1. What's your new consumption bundle and utility? Explain how AND why your consumptions of Jupiter and bitteballen change (if at all). Show the point of consumption on the original budget constraint (part (a) above) as well as consumption on the new budget constraint (draw it).

Solution:

$$\max U(j,b) = j^{\frac{3}{4}} b^{\frac{1}{4}} \text{ s.t. } 12 \geq 3j + 1b$$

$$\begin{aligned}
\mathcal{L} &: j^{\frac{3}{4}} b^{\frac{1}{4}} + \lambda(12 - 3j - b) \\
\frac{\delta \mathcal{L}}{\delta j} &: \frac{3}{4} j^{\frac{-1}{4}} b^{\frac{1}{4}} - 3\lambda \overset{\text{set}}{=} 0 \\
\frac{\delta \mathcal{L}}{\delta b} &: \frac{1}{4} j^{\frac{3}{4}} b^{\frac{-3}{4}} - \lambda \overset{\text{set}}{=} 0 \\
\frac{\delta \mathcal{L}}{\delta \lambda} &: 12 - 3j - b \overset{\text{set}}{=} 0
\end{aligned}$$

Now do some algebra to find b as a function of j using λ, i.e., $\frac{1}{4}(j^{\frac{3}{4}} b^{\frac{-3}{4}}) = \frac{3}{4}(j^{\frac{-1}{4}} b^{\frac{1}{4}}) \rightarrow$ (via multiplying both sides by $j^{\frac{1}{4}} b^{\frac{-1}{4}}$) $\rightarrow \frac{j}{b} = 1 \rightarrow j = b$.

Using this "optimal" ratio of j to b with the budget constraint, we get $12 = 3b + b = 4b \rightarrow b = 3$ and $j = 3$ and utility of $3^{\frac{3}{4}} 3^{\frac{1}{4}} = 3.00$.

Double check: €12 = €3(3) + €1(3)

You consume more bitteballen but not less Jupiter because the outward shift of the budget constraint (due to the lower price of b) has allowed you to go to a higher indifference curve *while* maintaining your consumption of j, which stays at 3 because of the (incredibly) high marginal utility of j. (Consumption of j falls and b rises if the relative price of b continues to fall, by the way.)

NB: The ratio of marginal rates of substitution (slope of the indifference curve) is equal to the ratio of prices at each optimum point. Without getting into the math, this means that the ratio of marginal utilities *at the consumption point* matches the price ratio. Thus a 1:3 ratio of marginal utilities at 3:1 consumption matches the 1:1 price ratio on a different indifference curve. Thus marginal utiltiies are different in the new bundle, but proportional, relative to each other, as prices are proportional relative to each other. In the second example, a 1:3 ratio of marginal utilities at 1:1 consumption matches the 3:1 price ratio. Put differently, you consume more b not because you like it that much but because it's cheaper. NB: Many of you implied that j consumption would stay the same due to its higher (initial) marginal utility, but that's NOT going to happen if p_j rises a lot.