Instructions: This problem set is due in class on Wednesday, September 22. If you get stuck, you are encouraged to ask questions of the instructor or the tutors. Jeff has office hours Friday 1:00–2:00pm, Monday 3:00–4:00pm, and Tuesday 10:0–11:00am in Vollum 229. Tutors will be available at work sessions Monday and Tuesday 7–10pm in the Dorothy Johansen House. Individual tutoring (at no cost for up to one hour per week) can be arranged through the Office of Student Services.

1. Present vs. future consumption. Consider a consumer Felicia's choice between "goods this year" (C_1) on the horizontal axis and "goods next year" (C_2) on the vertical axis. Both sets of goods are measured in dollar terms. We assume no inflation so that we don't need to worry about the distinction between real and nominal income and expenditure. We also assume that Felicia has no previous savings and does not want to have any savings at the end of next year, so these are the only two goods relevant to her consumption behavior. Both current and future consumption are normal goods. Felicia's preferences are such that she tends to like reasonably smooth consumption (close to equal in the two periods) rather than a very uneven consumption path.

Felicia earns $20,000 this year and $30,000 next year. She has the option of borrowing or lending at a 10% interest rate. She can borrow or lend as much as she wants at 10%, as long as she repays any borrowing next year. One consumption option is to consume the same amount as she earns in each period, so this "endowment point" ($C_1 = 20,000$, $C_2 = 30,000$) must lie on her budget constraint.

   a. What is the "relative price" of goods this year in terms of goods next year: the amount of next year's goods that must be given up to consume an additional unit of goods this year? How is this related to Felicia's budget constraint? Graph the budget constraint, showing the values at which it intersects each axis. Is it a straight line?
   b. Suppose that Felicia's current-year income increases by $1,000 with no change in future income. How will her consumption in the current year and the future year be affected?
   c. Now show the effects on consumption in the two periods of a $1,000 increase in next-year's income (with no change in current income). How (if at all) are they different from those in part (b)? Explain.
   d. Show the effects on consumption in the two periods of a $1,000 increase in income in each year ($2,000 total).
   e. Based on your analysis above, does an increase in someone's income have a larger effect on current consumption if it is believed to be permanent or if it is believed to be temporary? Why?
   f. We have assumed so far that Felicia is able to borrow or lend at the same interest rate. Now suppose, more realistically, that Felicia has to pay a higher interest rate (15%) on her borrowing than the rate that she receives if she lends (10%). What does the budget constraint look like in this case (at the original levels of income)? Does this imperfection in the credit market make it more likely that Felicia would choose to consume at exactly the endowment point? Why?

g. Finally, suppose that Felicia cannot borrow at all, but is able to lend at 10%. What does her budget constraint look like in this case? If she begins at a point of no lending, how (if at all) is the answer to part (e) different in this case?

2. Consumer Equilibrium. George has a given amount of income and can afford at most 9 units of Y if he spends his entire income on Y. Alternatively, if he spends all his income on X, he can afford at most 6 units of X.

a. What is the relative price of X in terms of Y? (How much Y must George give up to get a unit of X?)
b. Draw George's budget line and an indifference curve such that George chooses to buy 4 units of X. (Put X on the horizontal axis.)
c. In equilibrium, what is George's marginal rate of substitution between Y and X?
d. Martha faces the same prices as George, yet she chooses to buy 2 units of X. Is Martha's income higher, lower, or the same as George's, or can we tell for sure?
e. In equilibrium, is Martha's marginal rate of substitution between Y and X higher, lower, or the same as George's, or can we tell for sure?

3. Choosing between leisure and consumption. The consumer-equilibrium model can be used to examine the tradeoff between leisure and labor (or leisure and the goods that can be bought with one's labor earnings). To do this, we put weekly hours of leisure (non-work time) on the horizontal axis and the generic commodity "goods" on the vertical axis (measured in dollars). There are 168 hours in a week, so the number of leisure hours equals 168 minus the number of hours worked.

a. Suppose that a consumer, Colin, can work as many hours as he wishes during the week for a wage of $20/hour, but that he needs to sleep at least 42 hours per week (which counts as leisure). Show the graph of his budget constraint.

b. Colin and his friend Hugh face the same budget constraint, but they have very different preferences: Colin chooses to work 40 hours per week, but Hugh chooses zero. Show (on separate graphs) Colin and Hugh's indifference maps and their respective points of utility-maximizing equilibrium.

c. Suppose that overtime work (all hours above 40 per week) earns a doubled wage ($40/hour). Show how the budget constraint changes. Can you be sure that Colin will work overtime? Might Hugh choose to work now, and if so, will he work overtime?

d. Now suppose that (with no overtime wage), anyone who doesn't work at all gets $200 per week in welfare payments, but that these payments are reduced by $0.50 for each dollar of income earned, so that workers earning $400 or more per week get none. Might Hugh work? Might Colin quit working altogether? Might Colin choose to work fewer (but still positive) hours?