

Short Answer Questions

1. Geometrically, the marginal rate of substitution is the slope of the indifference curve at a given point. Economically, the marginal rate of substitution is the dollar value of the marginal hour of leisure. In other words the MRS is the amount of income the individual is willing to sacrifice to enjoy an additional leisure hour. An individual with a steep indifference curve has a relatively high MRS, while an individual with a flat indifference curve has a relatively low MRS. It follows, then, that an individual with a steep indifference curve is willing to sacrifice more income for an additional hour of leisure than an individual with a flat indifference curve and therefore the former individual attaches more value to an hour of leisure than does the latter individual.
2. The Earned Income Tax Credit gives an income tax credit to low income workers, which, dependent on earnings level, raises, leaves unchanged, or reduces the take home wage rate. Labor economists have deemed the EITC a success because: i.) much empirical analysis shows that, unlike welfare programs, the EITC has minimal work disincentives and, indeed, actually promotes labor force participation; ii.) the EITC is administered via the federal tax system and therefore does not have a stigmatizing effect on recipients; iii.) the EITC is a well focused anti-poverty program for which benefits flow directly to the target group.
3. Both workers face the same budget constraint since they earn the same wage rate and have no non-labor income. Since Frankie chooses to work 40 hours per week, she'll be further to the northwest on the budget constraint than is Johnny, who chooses to only work 10 hours per week. Using Figure SA3, let Frankie's initial utility maximization point be point F on the budget constraint, and let Johnny's be point J. If the wage increases by 10%, then Frankie is likely to experience the larger income effect as a result. This is because, other things equal (i.e., holding leisure and work hours constant), a 10% wage increase confers a much larger increase in income on Frankie (ΔY_F in Figure SA3) than it does on Johnny (ΔY_J in Figure SA3). Since the wage increase confers a much larger increase in purchasing power on Frankie, she will likely have a larger income effect as a result. We can make this assertion without knowledge of either worker's indifference curves.
4. The firm's profit maximization condition is employ labor to the point where $P \times MP_L = W$ or, to say the same thing where $MRP_L = W$. P is product price, MP_L is the marginal product of labor, W is the unit cost of labor, and $MRP_L (= P \times MP_L)$ is the marginal revenue product of labor. Marginal revenue product is the contribution to firm revenue of the marginal unit of labor. The condition says that a profit maximizing firm should employ every unit of labor for which $MRP > W$, since such a unit of labor contributes more to firm revenue than to firm cost and thus raises profit. The firm should avoid employing any unit of labor for which $MRP < W$, since such a unit of labor, though it contributes to revenue, does not contribute enough extra revenue to cover its cost of employment and thus reduces profit. The optimal stopping point occurs at the employment level at which $MRP = W$.

5. According to our labor supply model, labor force participation decisions are driven by comparison of the individual's MRS if not working and the wage rate (W) that could be earned if working. Specifically, if $MRS_{L=T} > W$, then the individual voluntarily chooses not to work, while if $MRS_{L=T} < W$, then the individual chooses to be a labor force participant. Therefore differences among men in labor force participation rates by age should be explicable on the basis of likelihood that these conditions are met. Figure SA5 shows a standard age-earnings profile. Worker earnings are relatively low at younger ages due to absence of marketable skills, grow with the accumulation of education, experience, and skills as the worker ages, and ultimately taper off and decline as human capital depreciates. Age-earnings profile data therefore show that W is highest in middle years. Other things equal, then, it is more likely that $MRS_{L=T} < W$ in the middle years.

How $MRS_{L=T}$ behaves over the life cycle is more speculative (we observe earnings but don't observe indifference curves). Nevertheless, one might argue that $MRS_{L=T}$ is relatively high for younger men, as there time can be profitably spent investing in skills via education and training experiences. Likewise, $MRS_{L=T}$ could be argued to be relatively high for older men as accumulated lifetime wealth and generally increasing taste for leisure would both increase the value of non-market time (i.e., raise the reservation wage). If the age- $MRS_{L=T}$ profile is U-shaped, then again this would imply a higher likelihood that $MRS_{L=T} < W$ for middle aged men.

Longer Problems

1. See Figure LP1a,b,c.
2.
 - a. One of the properties of the individual's utility function that we assume is diminishing marginal utility in both leisure and income. In other words, other things equal, the more you have of something, the less utility does the next/marginal unit of it yield, whether we're talking about leisure or income. The marginal rate of substitution, by definition, is the dollar value of the marginal hour of leisure. Therefore, consistent with the diminishing marginal utility idea, the more leisure one has, the lower should the MRS be and vice versa. It is also true that the MRS is the slope of an indifference curve at a given point. Hence it stands to reason that since the MRS is decreasing in L , it must also be the case that the indifference curve gets flatter as L increases. Therefore it follows from the diminishing marginal utility property of the utility function that indifference curves must be convex to the origin.
 - b. The reservation wage rate is the lowest wage at which someone would be willing to supply an hour of labor. By definition, the reservation wage is $MRS_{L=T}$, which, in this problem, is $MRS_A = \$8$.

- c. No, a decrease in non-labor income will not alter her decision to be a labor market participant. Jane's reservation wage is \$8 and her market wage is \$15, therefore $MRS_{L=T} < W$ and she is a labor market participant. A fall in non-labor income causes $MRS_{L=T}$ to decrease since leisure is a normal good. Consequently, the labor force participation continues to hold (to even greater degree) after the reduction in non-labor income and Jane remains in the labor force.
- d. Indifference curve U_2 and the budget constraint are tangent at point B. The slope of the budget constraint is $W = \$15$. The slope of an indifference curve at a given point is the marginal rate of substitution. Since the budget constraint and the indifference curve are tangent at B, it follows that $MRS_B = \$15$.
- e. $\$8 = MRS_A < W = \15 . This says that if Jane doesn't work at all, she would need \$8 in compensation for the sacrifice of an hour of leisure in the form of work. Someone will pay her \$15 for an hour of her time, however. This is \$7 above and beyond what she requires to remain at her initial level of utility. Hence, she will raise her utility by substituting income for leisure at the rate of \$15 per hour from point A.
- $\$25 = MRS_C > W = \15 . At 58 hours of work, Jane is willing to give up \$25 for an extra hour of leisure time. In other words, she's willing to "pay" \$25 for the marginal hour of leisure. Given her wage of \$15, however, she only has to sacrifice \$15 to gain the extra hour of leisure. In other words, the "price" of additional leisure is only \$15 per hour. At point C, therefore, sacrifice of \$15 to obtain additional leisure time will increase her utility (from point C, she's willing to pay \$10 more per hour for additional leisure than she has to).
- f. Leisure is a normal good. Consequently, an increase in non-labor income, leisure held constant, increases the marginal rate of substitution. With more non-labor income, therefore, $MRS_{L=133} > W = \$15$. With more non-labor income, Jane's willingness to pay for an additional hour of leisure exceeds leisure's opportunity cost (the wage rate) and she will work less and consume more leisure as a result.
3. Figure LP3a shows an individual with a dominating income effect. An increase in the wage from w_1 to w_2 , moves the utility maximizing income-leisure combination from point A to point B. The total effect of the wage increase is $L_B - L_A > 0$, implying a concomitant reduction in hours of work of the same degree. Using Figure LP3a, imagine the response had the individual depicted been given an increase in non-labor income just large enough to allow attainment of indifference curve U_2 without any change in the wage. The amount of non-labor income necessary to accomplish this is I_2 . Given this pure increase in non-labor income, the utility maximizing income-leisure combination is point C. There is only an income effect here and it is equal to $L_C - L_A > L_B - L_A$. Hence, per the quote, leisure consumption increases and hours of work decrease by a larger degree when a given change in wealth is generated by a change in non-labor income.

The wage increase from w_1 to w_2 also increases utility to U_2 , but the income effect of the wage increase is offset to some degree by the substitution effect ($= L_B - L_C < 0$) that accompanies the wage increase. The offset is not complete, however, since the quote stipulates that the income effect is dominant. Nevertheless, the indifference curve analysis of LP3a shows that, in the case of an individual for whom the income effect dominates, a rising wage rate results in more leisure consumed on net and therefore fewer hours worked.

A supply curve plots price against quantity supplied. In the case at hand, the relevant price is the wage rate (w) and the relevant quantity is hours of work ($H = T - L$). Given the dominating income effect of the individual shown in LP3a, a plot of the wage against hours worked for this individual should have a negative slope as in figure LP3b. This figure shows that hours worked decrease as the wage rises from w_1 to w_2 , consistent with the optimizing behavior displayed in the indifference curve graph.

4

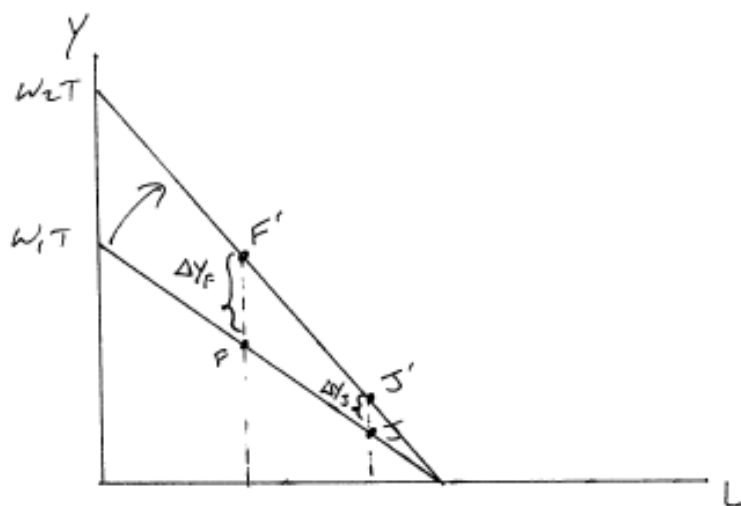
- a. An income replacement program paying a benefit that fully replaces a worker's earnings creates the spiked budget constraint (BAC) in Figure LP4a. The benefit, B , is equal to initial earnings, wH_0 . While working, the worker maximizes utility at point f in the graph. Full replacement of lost earnings by the program maintains the individual's money income at its original level, but allows the individual to enjoy much more leisure than was the case while working. Since leisure is a "good," more of it with no reduction in money income puts the individual on higher indifference curve U_2 . With full replacement of lost earnings, utility is maximized at point C . Since the benefit is lost if the individual does any work, a utility maximizing individual is better off at C than at f and therefore will wish to continue drawing the benefit and will not return to work.

In order to give the individual shown in the graph the incentive to return to work, Figure LP4a implies a benefit on the order of $\$Ag$ is appropriate. Such a benefit lies on an indifference curve just below U_1 . Consequently, when the worker is ready to return to work, the worker has the incentive to do so as point f is on a higher indifference curve than point g .

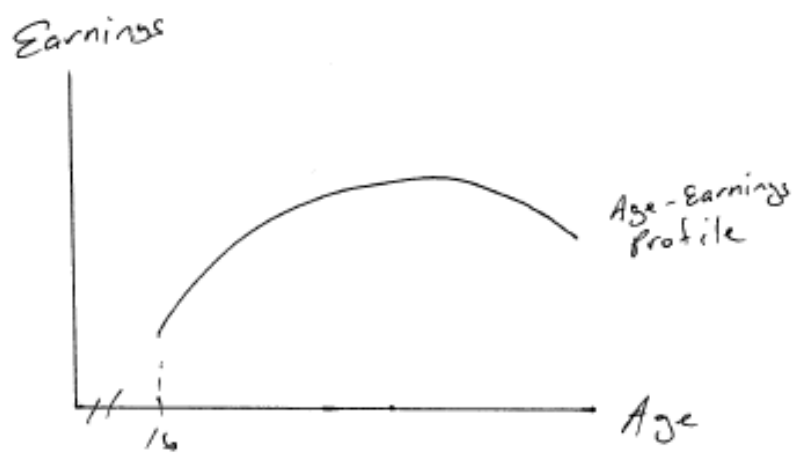
- b. While the theory of part a is all well and good, policy makers do not have the ability to observe individual indifference curves. The theory of part a implies that only a fraction of earnings should be replaced in order to induce return to work when appropriate. But what α is optimal? Individuals differ with respect to preferences for money income and leisure. Given individual differences in income-leisure preferences, $B = \alpha(wH_0)$, will continue to overcompensate some even though B is a fraction of initial earnings. Figure LP4b depicts indifference curves for three individuals, each with the same initial wage, hours of work, and earnings. Indifference curve U_1 belongs to the individual shown in part a. The other two indifference curves differ on the basis of convexity. The

individual possessing indifference curve U_1'' will also wish to return to work as soon as possible. The individual possessing indifference curve U_1' , however, will find benefit $\$Ag$ more than generous as it puts him/her on a higher indifference curve. Hence, while basic fairness and administrative practicality necessitate a one-size-fits all replacement ratio (α), the analysis of 4b nevertheless implies that fractional replacement of earnings does not give everyone enough incentive to return to work voluntarily.

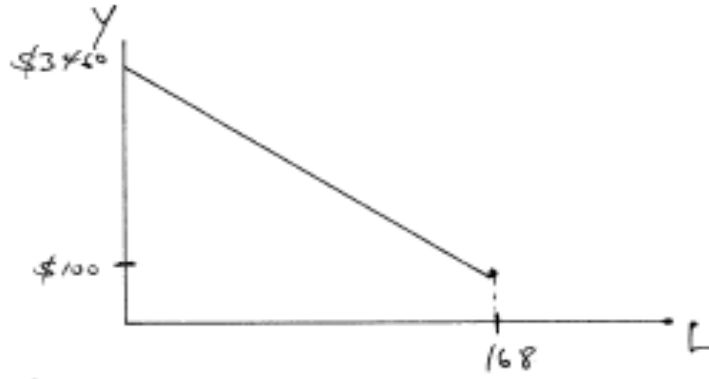
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SAS

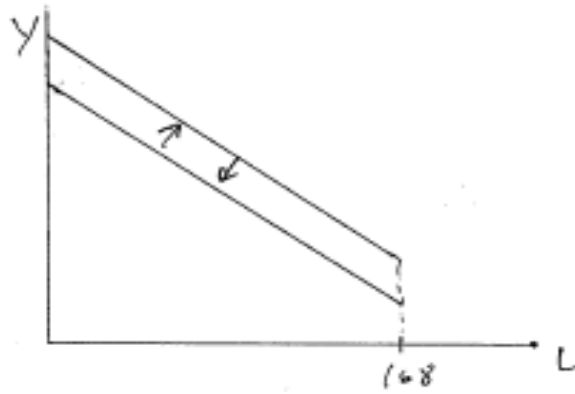


LP1
a.)

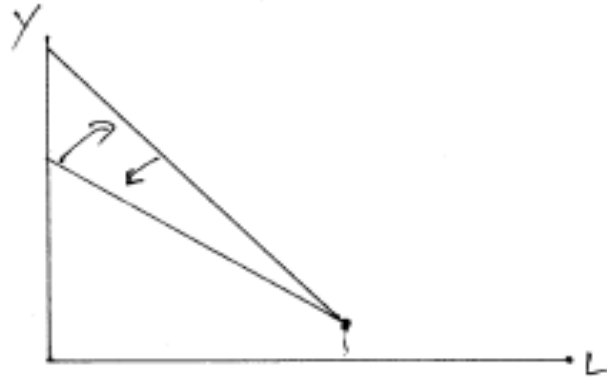


$$T = 168 \quad WT + I = \$3420$$

b.)

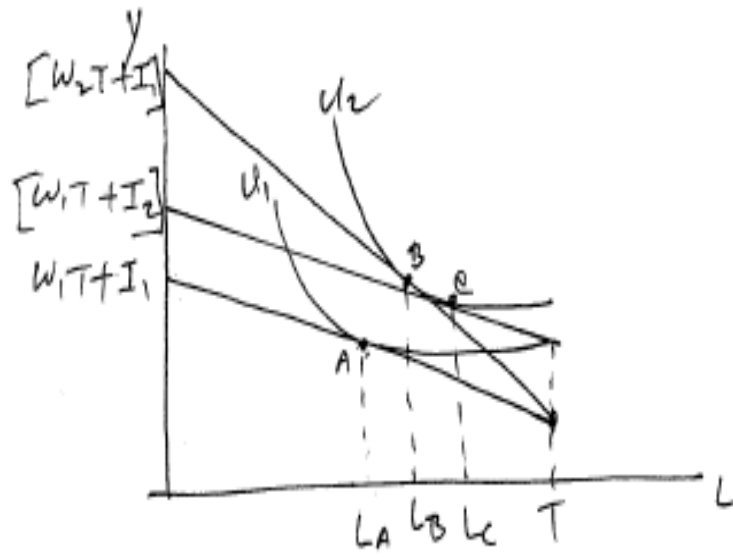


c.)

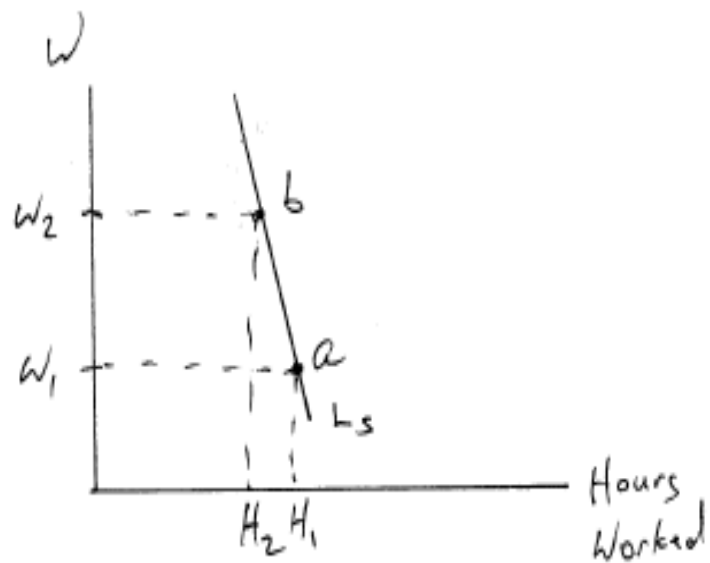


LP3

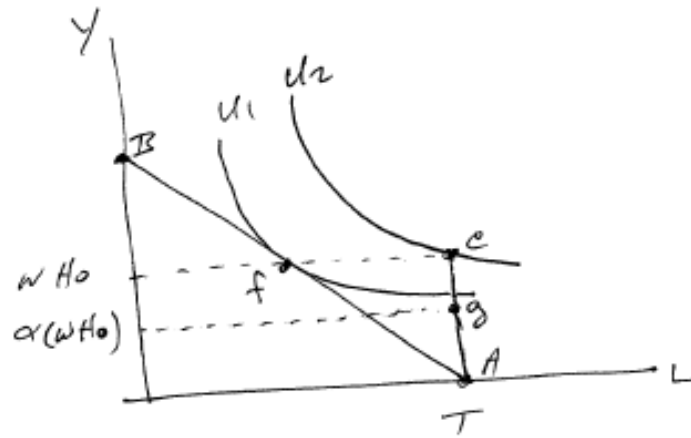
a.)



b.)



LP 4
a.)



b.)

