KEY

ECO 601 Problem Set #3 Fall 2002

4.1 $U = \sqrt{TS}$ $P_T = .10$ $P_S = .25$

$I = \$1.00$

(a) $\mathcal{L} = \sqrt{TS} + \lambda(1 - .1T - .25S)$

$\frac{d\mathcal{L}}{dT} = \frac{1}{2}T^{-1/2}S^{1/2} - .1\lambda = 0$

$\frac{d\mathcal{L}}{dS} = \frac{1}{2}T^{1/2}S^{-1/2} - .25\lambda = 0$

$\frac{d\mathcal{L}}{d\lambda} = 1 - .1T - .25S = 0$

$$\frac{\frac{1}{2}T^{-1/2}S^{1/2}}{\frac{1}{2}T^{1/2}S^{-1/2}} = \frac{.1\lambda}{.25\lambda}$$

or $\frac{T}{S} = 2.5$ or $T = 2.5S$

substituting into budget constraint gives

$1 = .5S$, so $S = 2$ $T = 5$

and $U = \sqrt{10}$

(b) $U = \sqrt{TS}$. Keeping $U = \sqrt{10}$ (i.e. same level as before)

means $TS = 10$.

From (a) we know that $\frac{MU_T}{MU_S} = \frac{\frac{1}{2}T^{-1/2}S^{1/2}}{\frac{1}{2}T^{1/2}S^{-1/2}} = \frac{S}{T}$

i.e. $MRS = \frac{S}{T}$. Setting $MRS = \frac{P_T}{P_S}$ yields:

$\frac{S}{T} = \frac{.40}{.25}$ for utility maximum

or $T = \frac{5}{8} \cdot S$

since $U = \sqrt{TS} = \sqrt{10}$,

$\frac{5}{8}S^2 = 10$

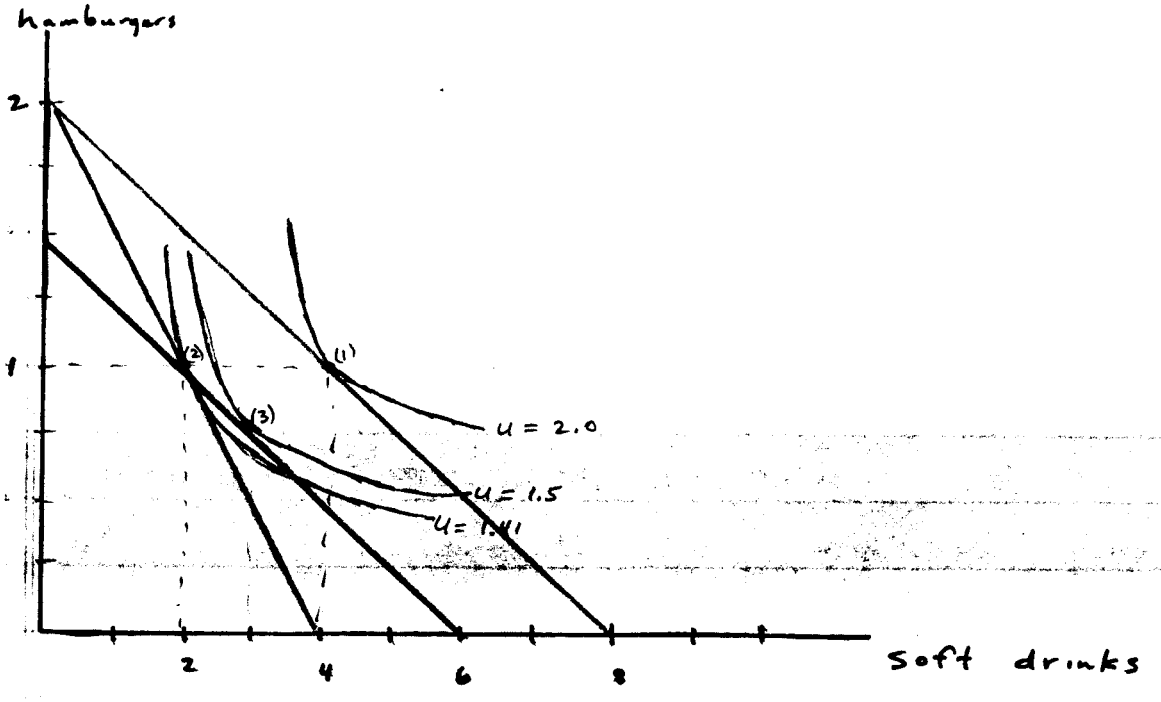
$S^2 = 16$ $S = 4$ $T = 2.5$

This bundle ($S=4$, $T=2.5$) costs

$4(.25) + 2.5(.40) = \$2.00$

so Paul needs another dollar.

2.

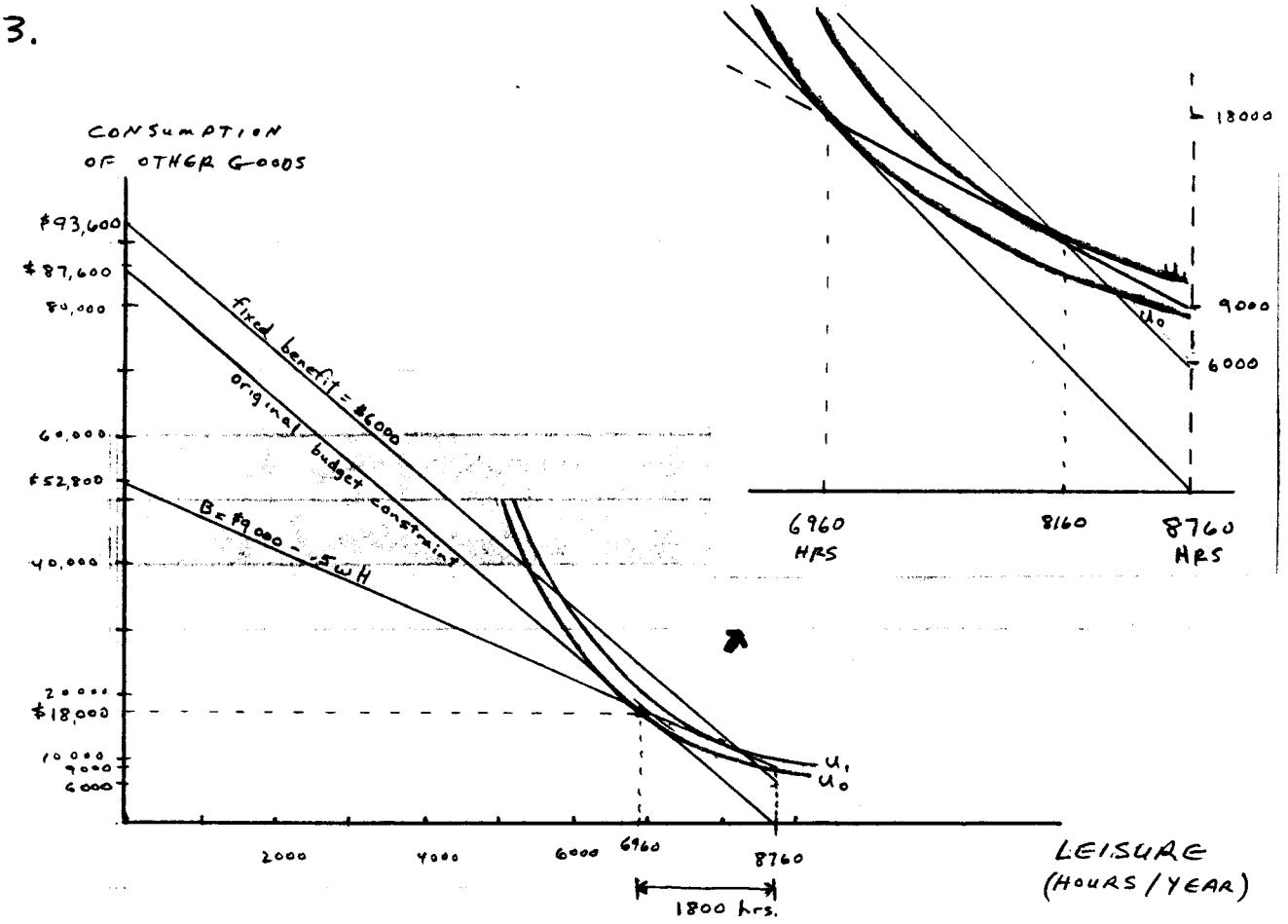


(1) H = 1 SD = 4 u = 2

(2) H = 1 SD = 2 u = 1.41

(3) H = .75 SD = 3 u = 1.5

3.

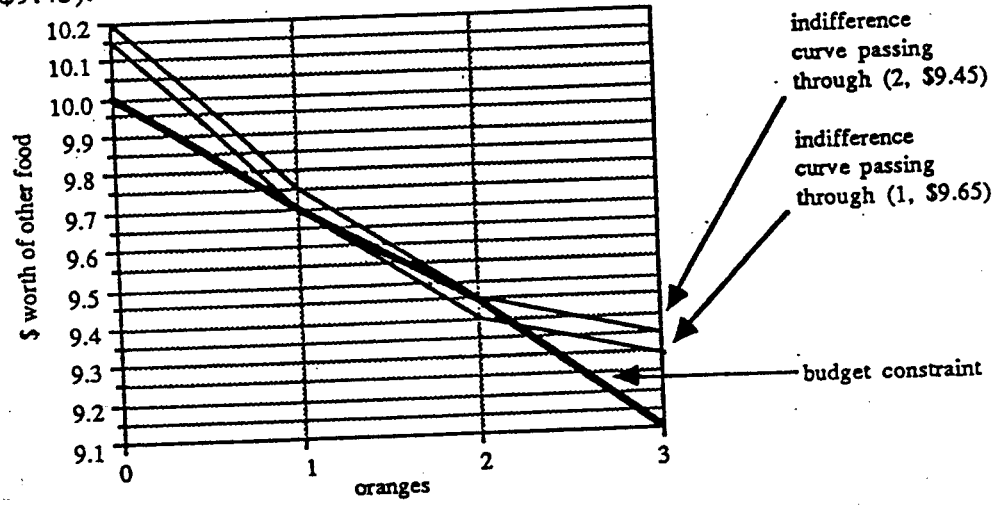


WORK = 8760 hrs - LEISURE = 8760 - 6960 = 1800 hrs.

(a) Initially Mr. Duffer consumes 6960 hours of leisure and $18,000 of other goods. After retirement he could continue to work 1800 hours per year, and his income would be 9000 +.5wH = $18,000. In other words, he could consume his original bundle of 6960 hours of leisure and $18,000 of consumption goods. That would put him on U_0. By substituting toward leisure (by working less) he could reach U_1. So his claim makes sense.

(b) Mr. Duffer's budget constraint under the alternative retirement program is parallel to his original pre-retirement budget constraint, except it shifts upward by $6,000. He could choose the bundle that he consumes under the retirement program described in (a) that has 600 hours of work (8160 hours leisure) and $12,000 consumption of other goods. But he can reach a higher indifference curve by working more than 600 hours. Whether he chooses to work more than 1800 hours per year under this new retirement plan depends on whether leisure is a normal or inferior good, but it is at least possible that he would choose to work more than 1800 hours.

4.10. Suzy has incorrectly compared her marginal willingness to trade (MRS) to the *average* terms of trade. She should have compared MRS to the *marginal* terms of trade: Once she has decided to buy one orange, the cost of the second is only $.20. Since MRS = .25 between 0 and 1, it exceeds her marginal terms of trade and she can increase utility by buying the second orange. On the other hand, MRS = .10 from 2 to 3 and is less than the marginal terms of trade, which have increased to $.35. Thus 2 oranges will give her more utility than either 1 or 3. This is clear in the diagram, where the highest indifference curve that touches her budget constraint passes through the point (2, $9.45).



Note: In the above diagram, the budget constraint is kinked. The diagram below exaggerates the diagram above: