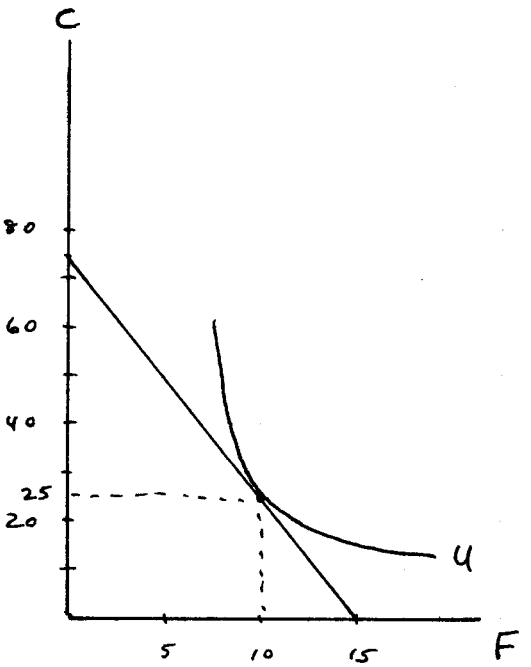
ECO 601 Problem Set #3 KEY Fall 2003

1. 4.2 $U(F, C) = F^{2/3} C^{1/3}$ $I = 300$



a. $P_F F + P_C C = 300$ $20F + 4C = 300$

$\mathcal{L} = F^{2/3} C^{1/3} + \lambda(300 - 20F - 4C)$

$\frac{\partial \mathcal{L}}{\partial F} = \frac{2}{3}\left(\frac{C}{F}\right)^{1/3} - 20\lambda = 0$ $20\lambda = \frac{2}{3}\left(\frac{C}{F}\right)^{1/3}$

$\frac{\partial \mathcal{L}}{\partial C} = \frac{1}{3}\left(\frac{F}{C}\right)^{2/3} - 4\lambda = 0$ $4\lambda = \frac{1}{3}\left(\frac{F}{C}\right)^{2/3}$

$5 = 2\frac{C}{F}$, $2C = 5F$

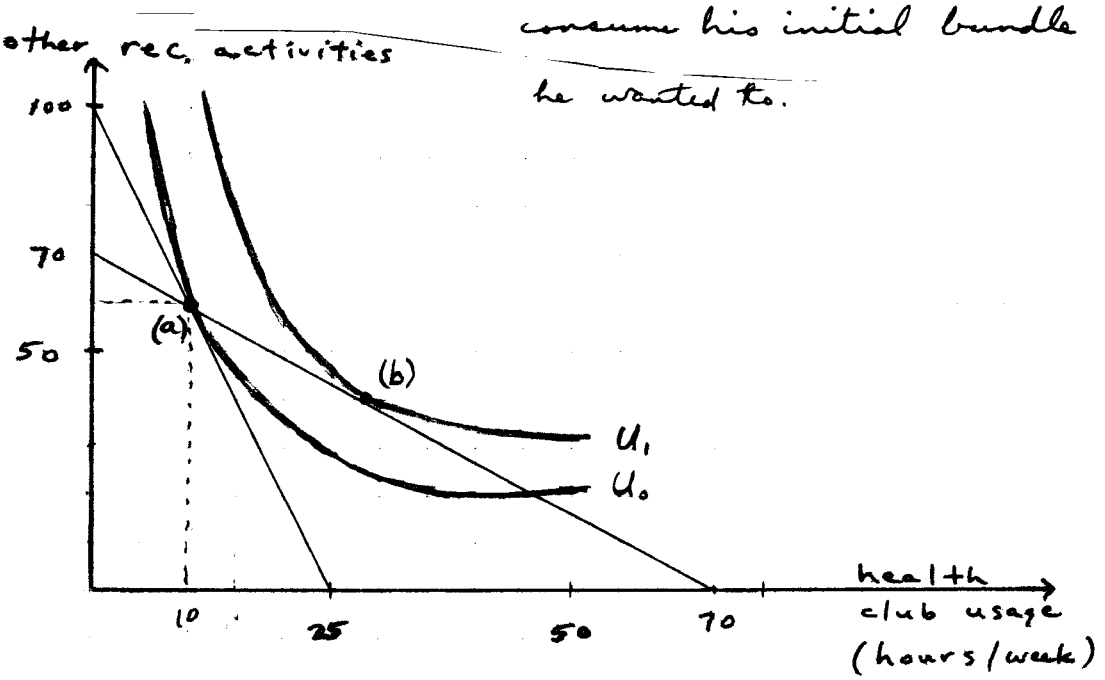
Budget constraint: $20F + 4C = 300$, $30F = 300$,

$F = 10$, $C = 25$.

2. (a) Mick chooses $X = 10$, $Y = 60$, and achieves $U = U_0$

(b) Mick chooses consumption bundle (b) and achieves $U = U_1$

He prefers the new pricing scheme, since he could consume his initial bundle if he wanted to.



3. $u(x,y) = x^{1/2} + y^{1/2}$

$\mathcal{L} = x^{1/2} + y^{1/2} + \lambda (I - x P_x - y P_y)$

1st O.C.:

(1) $\frac{\partial \mathcal{L}}{\partial x} = \frac{1}{2} x^{-1/2} - \lambda P_x = 0$

(2) $\frac{\partial \mathcal{L}}{\partial y} = \frac{1}{2} y^{-1/2} - \lambda P_y = 0$

(3) $\frac{\partial \mathcal{L}}{\partial \lambda} = I - x P_x - y P_y = 0$

(1) and (2) imply that $\left(\frac{y}{x}\right)^{1/2} = \frac{P_x}{P_y}$,

or $\frac{y}{x} = \frac{P_x^2}{P_y^2}$ or $x P_x^2 = y P_y^2$.

Substituting into the budget constraint gives:

$I - x P_x - \left(x \frac{P_x^2}{P_y^2}\right) P_y = 0$,

$I - x P_x - x P_x^2 / P_y = 0$,

$I = x P_x + x P_x^2 / P_y$,

$x^* = I / [P_x + P_x^2/P_y] = I / [P_x (1 + P_x/P_y)]$

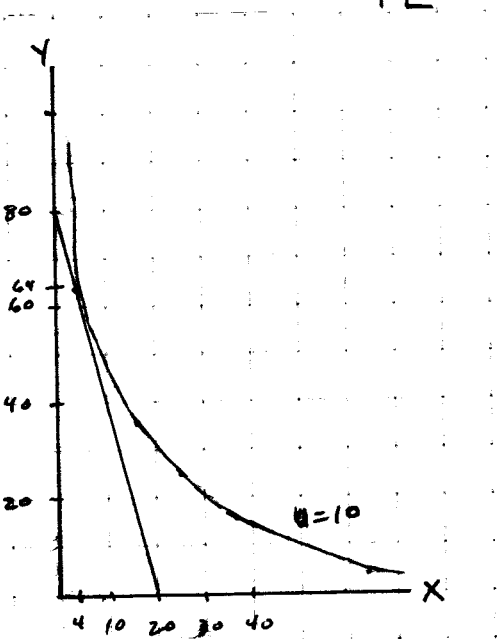
similarly for y:

$y^* = I / [P_y (1 + P_y/P_x)]$

if $I = 200$, $P_x = 10$, $P_y = 2.5$, then

$x^* = 200 / [10(1 + \frac{10}{2.5})] = 4$

$y^* = 200 / [2.5 (1 + \frac{2.5}{10})] = 64$



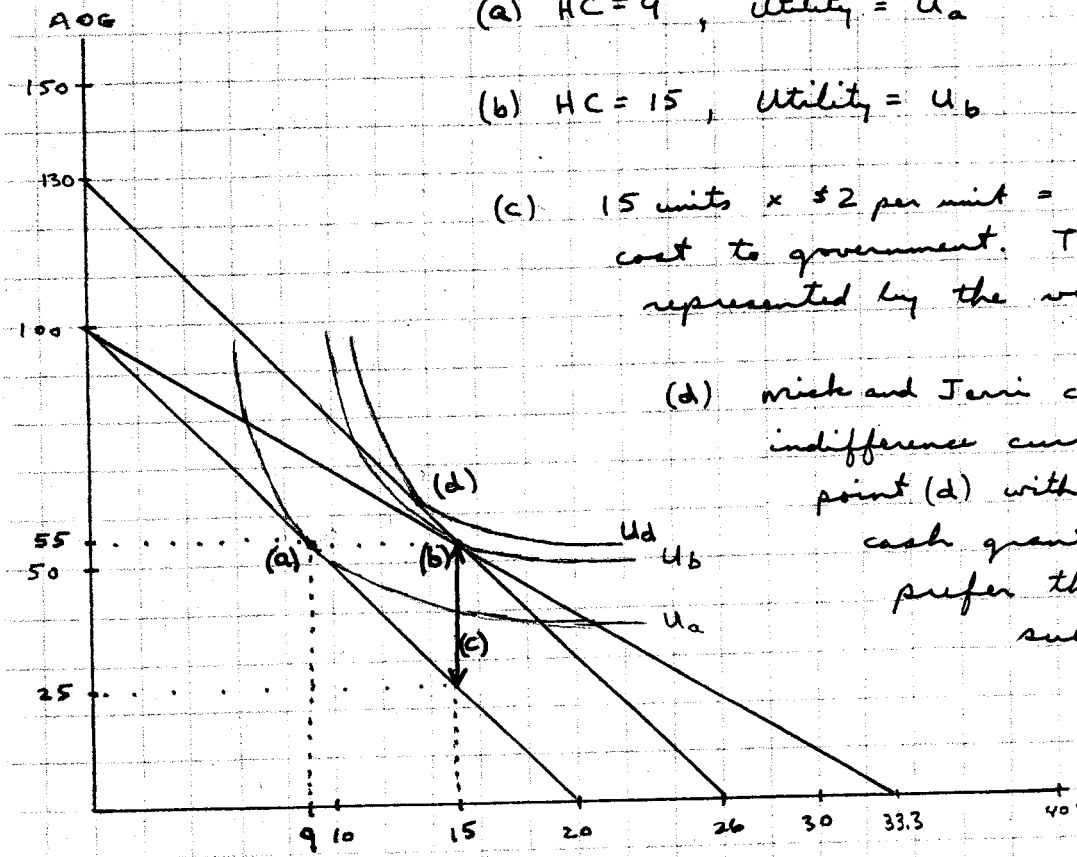
$u = x^{1/2} + y^{1/2}$

$u = (4)^{1/2} + (64)^{1/2} = 10$

$u = 10$:

x	y
25	25
16	36
9	49
4	64

4.



(a) HC = 9, Utility = U_a

(b) HC = 15, Utility = U_b

(c) 15 units × \$2 per unit = \$30.00 cost to government. This is represented by the vertical distance: (b) ↕ (c)

(d) Mick and Jerri can reach indifference curve U_d at point (d) with an unrestricted cash grant, so they will prefer this to the subsidy program.