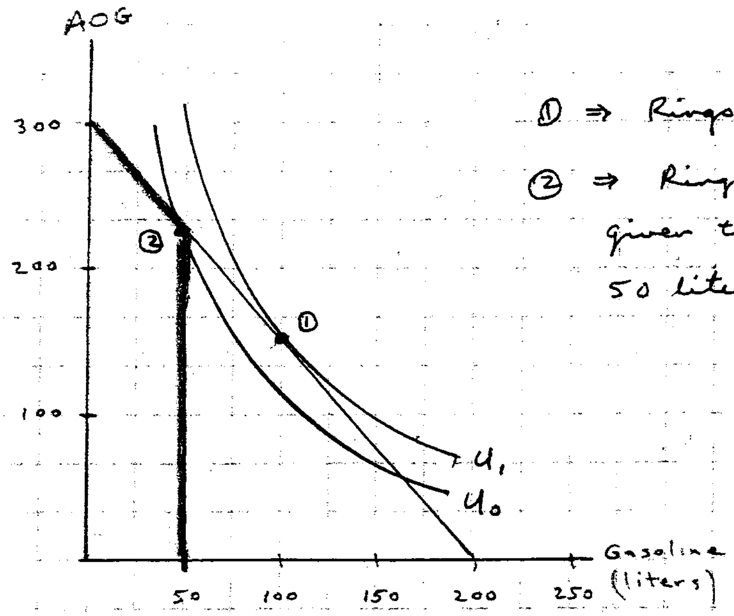
ECO 601 Problem Set #3 KEY Fall 2004

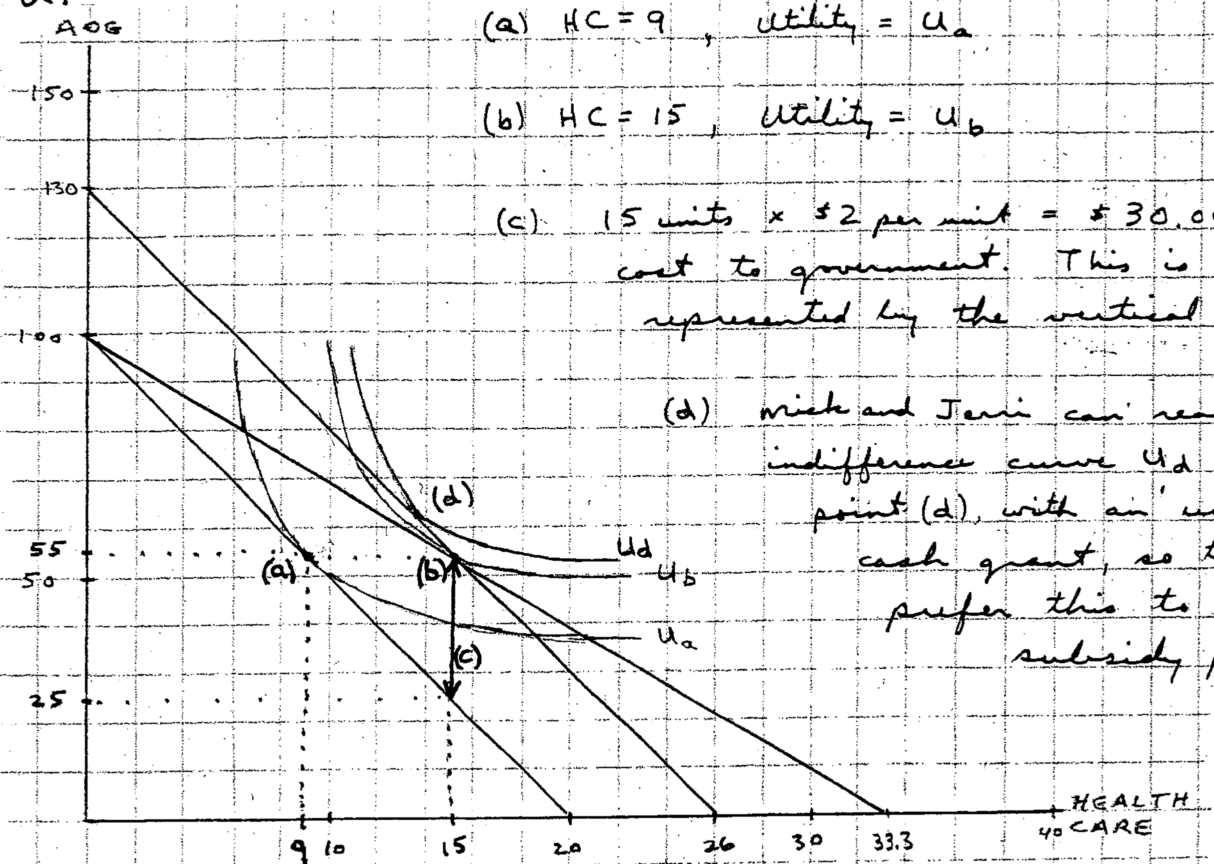
1.



① ⇒ Ringo's desired bundle.

② ⇒ Ringo's actual bundle, given that he can only get 50 liters of gasoline per week.

2.



(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.

3. $U = S + \ln B$

$\mathcal{L} = S + \ln B + \lambda(I - P_S S - P_B B)$

$\frac{d\mathcal{L}}{dS} = 1 - P_S = 0$

$\frac{d\mathcal{L}}{dB} = \frac{1}{B} - P_B = 0$

$\Big\}\ B = \frac{P_S}{P_B}$, or $P_B B = P_S$

$\frac{d\mathcal{L}}{d\lambda} = I - P_S S - P_B B = 0$

$I - P_S S - P_S = 0$

$S^* = \frac{I - P_S}{P_S}$

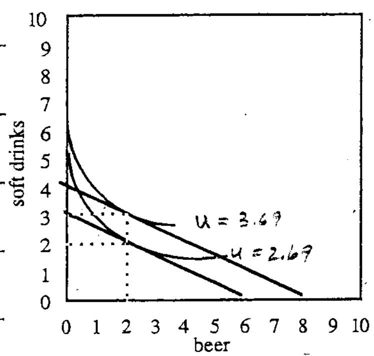
$B^* = \frac{P_S}{P_B}$, which doesn't depend on I!

If $I = 6$, $P_B = 1$, and $P_S = 2$, then

$S^* = 2$ and $B^* = 2$

If $I = 8$, $P_B = 1$, and $P_S = 2$, then

$S^* = 3$ and $B^* = 2$



$u = S + \ln B$

$S = 2,\ B = 2 \Rightarrow u = 2.693$

$S = 3,\ B = 2 \Rightarrow u = 3.693$

4. $U = Y^{.8} F^{.2}$, $I = 500$, $P_Y = 1$, $P_F = 2$

(a) $\mathcal{L} = Y^{.8} F^{.2} + \lambda(I - P_F F - P_Y Y)$

$\frac{d\mathcal{L}}{dY} = .8 Y^{-.2} F^{.2} - \lambda P_Y = 0$

$\frac{d\mathcal{L}}{dF} = .2 Y^{.8} F^{-.8} - \lambda P_F = 0$

$\Big\}\ \frac{.8F}{.2Y} = \frac{P_Y}{P_F} \Rightarrow 4FP_F = YP_Y$

$\frac{d\mathcal{L}}{d\lambda} = I - P_F F - P_Y Y = 0$

$I - 4P_F F - P_F F = 0$, $F^* = \frac{I}{5P_F}$

$I - P_Y Y - \frac{1}{4} P_Y Y = 0$, $Y^* = \frac{4I}{5P_Y}$

if $I = 500$, $P_Y = 1$, $P_F = 2$, then $F^* = 50$ and $Y^* = 400$

$u = (400)^{.8}(50)^{.2} = 263.9$

(b) if $I = 700$, then $F^* = 70$ and $Y^* = 560$

$u = (560)^{.8}(70)^{.2} = 369.5$

(c) see diagram. Ronald's utility maximizing bundle given his new kinked budget constraint is $F = 100$ and $Y = 500$.

$$U = (500)^{.8}(100)^{.2} = 362.4$$

(d) if Ronald were consuming Y and F such that $MRS_{F,Y} = \frac{P_F}{P_Y}$, what combination of Y and F would give $U = 362.4$?

$$MRS_{F,Y} = \frac{P_F}{P_Y} \Rightarrow 4FP_F = YP_Y$$

$$\Rightarrow 4 \cdot F \cdot 2 = Y \cdot 1$$

$$\Rightarrow Y = 8F$$

$$362.4 = (8F)^{.8}(F)^{.2} = (8)^{.8}F^{.8}F^{.2}$$

$$\text{or } F = 362.4 / 8^{.8} = 68.7$$

$$Y = 8F = 549.3$$

$$TC = 2 \cdot 68.7 + 1 \cdot 549.3 = \$686.70$$

so Ronald would be willing to accept \$186.70 in place of \$200 of food stamps.