Homework #3 Brady Bulls

Problem #1

$Y_t = 10K_t^{0.3}(A_tL_t)^{0.7}$

$C_t = 0.8Y_t$

$d = 0.08$

$n = 0.02$

$g = 0.01$

$L_0 = 10$

$A_0 = 10$

$K_0 = 15{,}000$

a) Steady-State

$s\tilde{y} = (n+g+d)\tilde{k}$

$\tilde{y} = 10\tilde{k}_t^{0.3}$, $\tilde{k}^* = \left(\frac{s}{(n+d+g)}\right)^{\frac{1}{1-a}}$

$C_t = (1-s)y_t$

$(1-s) = 0.8$

$s = 0.2$

$\tilde{k}^* = \left(\frac{10(0.2)}{0.11}\right)^{1/0.7} \approx 63.021$

$\tilde{k}^* \approx 63.021$

$\tilde{y}^* = 10(63.021^{0.3}) \approx 34.661$

$\tilde{c}^* = (1-0.2)34.661 \approx 27.729$

$\tilde{i}^* = 0.2(34.661) \approx 6.932$

$\boxed{\tilde{k}_t^* \approx 63.021,\ \tilde{y}_t^* \approx 34.661,\ \tilde{c}_t^* \approx 27.729,\ \tilde{i}^* \approx 6.932}$

b) Policy 1: Increase savings to golden rule through tax incentives

(i) $MPK = n+g+d = 0.11$, $MPK = \beta a k^{a-1} = 10(0.3k^{-0.7})$

$10(0.3k^{-0.7}) = 0.11$ $k \approx \left(\frac{s}{n+g+d}\right)^{1/1-a}$

$3k^{-0.7} = 0.11$ $112.471 = \left(\frac{s}{0.11}\right)^{1/0.7}$

$\frac{3}{k^{0.7}} = 0.11$ $\boxed{S = 0.3}$

$3 = (k^{0.7})0.11$

$\left(\frac{3}{.11}\right)^{1/7} = (k^{0.7})^{1/7}$

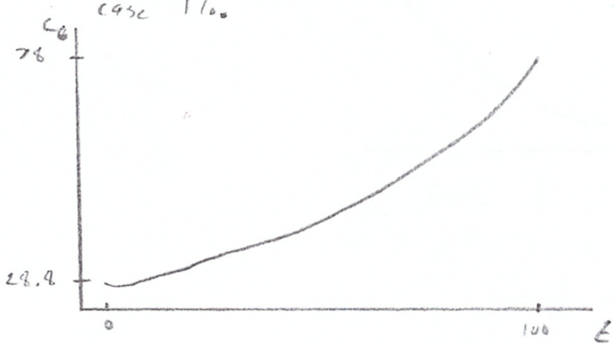
$\left(\frac{3}{.11}\right)^{1/0.7} = k$

$k \approx 112.471$

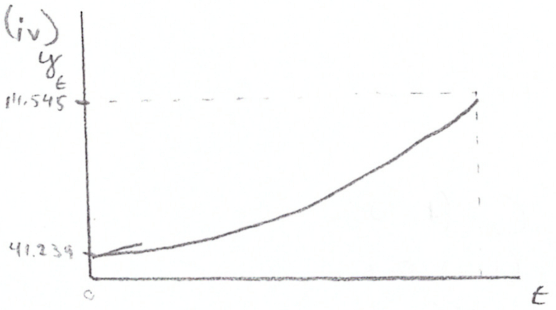
(ii) $C_0 = (1-0.3)41.239 \approx 28.868$

$C_{100} = 28.868(1+0.01)^{100} \approx 78.081$

(iii) The consumption graph is drawn this way b/c it experiences constant growth at rate g, in this case 1%.



(iv)



Like consumption, output is growing at a constant rate g, which is the nature of technological growth in the solow model

c) Policy 2; Increase g to 0.02

(assuming s = 0.2, not the golden rule)

(i)

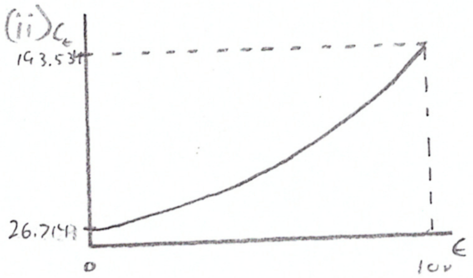
$\tilde{k} \approx \left(\frac{0.2}{0.12}\right)^{1/0.7} \approx 55.654$

$y \approx 10(55.654^{0.3}) \approx 33.392$

$y_{100} = 33.392(1+0.02)^{100} \approx \underline{241.917}$

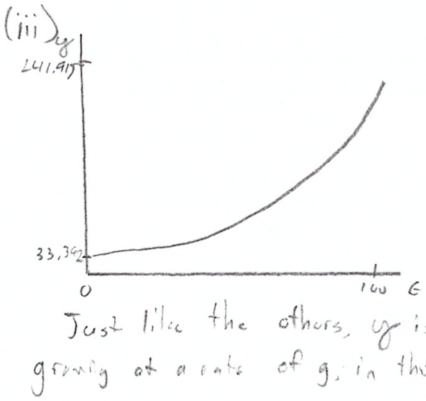
$c_{100} = y_{100}(1-0.2) \approx 193.534$

(ii)



While no longer saving at the golden savings rate, by increasing g, techology, they have increased the rate the economy is growing to 0.02.

(iii)



Just like the others, y is growing at a rate of g, in this case now 0.02.

d) Looking at y, output per effective worker, increasing the technological rate, g, has the most powerful longrun effect. The golden savings rate of policy 1 is only maximizing consumption

e) The difficulty in ranking the two policies comes down to "who's askin'". From a long-run perspective, policy 2 is the clear winner, as raising g will grow output per effective worker faster. From a living standards perspective, policy 1 is better. The golden savings rate maximizing consumption per effective worker per period, which is the main measurement of living standard.