Economics 314 Spring 2020

Daily Problem #12 February 17

In the R&D model of Romer's Chapter 3,

$$\frac{\dot{g}_K(t)}{g_K(t)} = (1-\alpha)\left(g_A(t) + n - g_K(t)\right) \text{ and}$$

$$\frac{\dot{g}_A(t)}{g_A(t)} = \beta g_K(t) + \gamma n + (\theta - 1) g_A(t).$$

This means that $\dot{g}_K(t) = 0$ when $g_K(t) = g_A(t) + n$, which is an upward-sloping line with slope = 1 and intercept = n (with g_A on the horizontal axis), and that $\dot{g}_A(t) = 0$ when $g_K(t) = -\frac{\gamma n}{\beta} + \frac{1-\theta}{\beta} g_A(t)$, which has positive slope $\frac{1-\theta}{\beta}$ and intercept $-\frac{\gamma n}{\beta}$.

1. Is $\dot{g}_K > 0$ above or below the $\dot{g}_K = 0$ line? Show appropriate arrows in the two regions.

2. Is $\dot{g}_A > 0$ above or below the $\dot{g}_A = 0$ line? Show appropriate arrows in the two regions.

3. If $\beta + \theta < 1$ and $n > 0$, show how the two curves relate to one another and the directions of motion (for both g_K and g_A) in the relevant regions.

4. Repeat #3 for $\beta + \theta = 1$ and $\beta + \theta > 1$, assuming again that $n > 0$.