Day 2 - Math preliminaries

Problems

You've got the following information on GDP.

Year	Level	Growth	Growth rate
2018	100		
2019	101	?	?%
2020	105	?	?%
2021	106	?	?%
2022	107	?	?%
2023	102	?	?%
2024	112	?	?%

1. Fill in the growth and growth rate of GDP for each year in the table (e.g. from 2018 to 2019). Put the growth rates in percent form.
2. What is the annualized growth rate from
    a. 2018 to 2024?
    b. 2018 to 2022?
    c. 2020 to 2023?
3. Add a column to the table with the log of GDP in each year. Use those logs to calculate the growth rates for each year (e.g. from 2018 to 2019). How do they compare with the ones you calculated in problem 1, are they close?
4. Use the logs to calculate the annualized growth rate from
    a. 2018 to 2024?
    b. 2018 to 2022?
    c. 2020 to 2023?
5. Evaluate $\ln Z$ in each of these cases:
    a. $Z = X^{\beta}W^{\gamma}$
    b. $Z = H^{\beta}/W^{\gamma}$
    c. $Z = G^{\alpha}e^{\gamma}$
    d. $Z = X^{\beta}W^{\gamma}L^{1-\beta-\gamma}$.

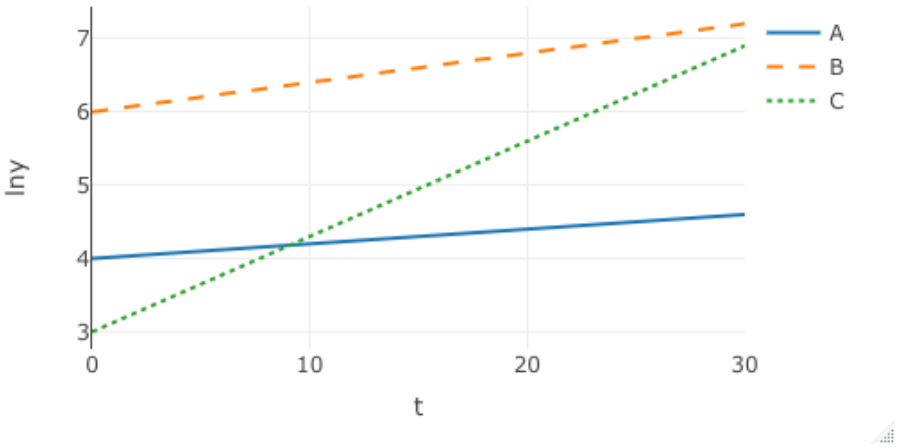

Figure: Plot

6. Find the growth rate of Z, g_Z, in each of the four cases from problem 1.

7. What's the growth rate of B in each case?

   a. $B(t) = B(0)(1 + g_B)^t$

   b. $B(t) = B(0)e^{g_B t}$

   c. $B(t) = 12 \times (1 + .03)^t$

   d. $B(t) = 8 \times (1.04)^t$

   e. $B(t) = 4e^{.03t}$

8. For each of the cases in the prior, take logs of the expression. If you graphed $\ln B(t)$ on the y-axis against t on the x-axis in each case, what would be the slope, and what would be the intercept?

9. Look at the attached figure. Which country has the highest growth rate, which has the lowest? Which has the highest baseline *level* of GDP, which has the lowest?