Introductory Macroeconomics
Homework 1: Gross Domestic Product (GDP)

Javier Tasso

1. T/F. The purchase of a used car contributes to current GDP.
2. T/F. Imported goods increase GDP because they expand consumption.
3. T/F. Nominal GDP can increase even if real GDP does not.
4. T/F. Intermediate goods are excluded from GDP to avoid double counting.
5. T/F. If a car is produced in 2024 but not sold, it is not counted in 2024 GDP.
6. In an imaginary economy only three goods are produced: Apples, Bananas, and Coconuts. The following table displays their prices and quantities for the years 21-23.

		Apples	Bananas	Coconuts
2021	p	1	2	5
	q	20	25	10
2022	p	2	3	4
	q	30	30	12
2023	p	1	3	6
	q	24	35	8

   (a) Calculate nominal GDP in 2021, 2022, and 2023.
   (b) If 2021 is the base year, calculate real GDP in 2021, 2022, and 2023. What's the (real) GDP growth between 2021 and 2022? And between 2022 and 2023?
   (c) If 2022 is the base year, repeat the previous question.

7. This exercise implements the chain weighted method for calculating real GDP. An island economy produces only lobsters and crabs. The following table displays the information for years 2004 (base year) and 2005. Calculate:

		Crabs	Lobsters
2004	p	12	10
	q	50	100
2005	p	10	15
	q	60	110

   (a) Nominal GDP in 2004 and 2005.
   (b) The value of 2005 production in 2004 prices.
   (c) The percentage increase in production when valued at 2004 prices.
   (d) The value of 2004 production in 2005 prices.
   (e) The percentage increase in production when valued at 2005 prices.

(f) The average percentage increase in productions. Hint: calculate the simple average between your answers in (c) and (e).

(g) Real GDP in 2004 and 2005 using your answer of part (f).

8. There are two firms in an imaginary economy. Firm A produces wheat and firm B produces bread. Firm A sells 10 units of wheat to firm B at a price of \$70 per unit. It employs 10 workers at a wage of \$10 per worker and pays \$50 in rents to domestic landowners. It buys a tractor from Mars at the price of \$300 for future production. Firm B imports 5 units of sugar from another country at a price of \$5 per unit and buys the 10 units of wheat from firm A. Firm B sells 10 units of bread at a price of \$100 per unit to domestic consumers and exports 2 units of bread at a price of \$200 per unit. Consumers in the local country import fish from abroad valued in \$50 in total. Calculate GDP using:

   (a) The expenditure approach.

   (b) The income approach.

   (c) The value added approach.

   Your final answer of (a), (b), and (c) will be the same. In all cases, make sure to write down the intermediate steps.

9. Decide if the following items are included or not in the calculation of GDP:

   - A new phone sold at a store.
   - A used laptop sold on Facebook marketplace.
   - A realtor's commission on the sale of a 1998 house.
   - A stock purchase.
   - Rent paid by a tenant.
   - State government spending on public school teachers' salaries.
   - An Uber ride.
   - A computer chip sold by Intel to Dell for laptop assembly.
   - A parent cooking dinner at home.
   - A student's expenditures in illegal substances.

10. Work with the Big Mac Index. Choose one country and one year and answer.

    (a) What's the price of a Big Mac in the US? What's the price in your country of choice? Be clear about the units.

    (b) What's the implied exchange rate between these two countries? Be clear about the units.

    (c) What's the actual nominal exchange rate between these two countries? Be clear about the units.

11-15. Read this article about the Okun's law. Follow these steps to replicate the first figure you see in the article. To receive full credit you'll need to label the axis properly and to make sure it is easy to understand. Please submit the final graph. Please do NOT submit the intermediate steps you took to create it.

    (a) Download data on unemployment and real GDP from here.

    (b) Calculate the growth rate of real GDP since the previous year. Because this is quarterly data, you want to calculate $g_y(t, t-4) = \frac{y_t - y_{t-4}}{y_{t-4}}$ where y is real GDP.

    (c) Calculate the change in unemployment from the previous year, this is, $u_t - u_{t-4}$, where u is the unemployment rate.

    (d) Make a scatterplot with the growth rate of real GDP on the x-axis and the change in unemployment on the y-axis. Add the linear fit to your scatterplot.