

Instructions: Do 5 problems out of the 7 below. Write your name and the problems you have chosen at the top of the first page of your test booklet.

1.

(a) The gross domestic product (GDP) of a certain country was 500 billion dollars at the beginning of 2005 and has been increasing at the percentage rate of 2.7% per year. Find out what is the GDP at the beginning of 2015.

(b) The magnitude formula for the Richter scale R is:

$$R = \frac{2}{3} \log_{10}(E/E_0)$$

where E is the energy released by the earthquake (in joules) and $E_0 = 10^{4.4}$ is a reference energy value corresponding to level $R=0$.

Find out how much energy was released by the Fukushima earthquake (2011) which measured 9.0 on the Richter scale.

2.

(a) Find what is more convenient for you now at the beginning of the year as a choice for the end of the year:

(i) to invest 3.000 euro in an investment that earns an annual interest of 2.8% compounded quarterly;

(ii) to invest 3.000 euro in an investment that earns an annual interest of 2.6% compounded continuously;

(iii) to sell the whole set of your old college books at a price of 80 euro.

(b) You are going to invest your money in an account that earns an annual interest R compounded continuously. If you are told that you will double your investment in 15 years, how much is the interest rate R that you have been offered?

3.

Compute the following limits

$$\lim_{x \rightarrow 1} \frac{\ln(x^2 - x + 1)}{\sqrt{x} - 1}$$

$$\lim_{x \rightarrow 0^+} \frac{x^2 + 2}{x^2 - x}$$