MATHEMATICAL ANALYSIS
L3 - EXERCISES LIST 2: **Approximated integrals**

1. a) Approximate the value of the integral integral $\int_0^1 \frac{dx}{1+x}$ using the trapezoidal rule with ten subdivisions over the interval of integration.
   b) Find a bound for the error of the approximation(a).
   c) Compare the exact and approximated values of the integral.
2. a) Use the trapezoidal rule to approximate $\frac{\pi}{4} = \int_0^1 \frac{dx}{1+x^2}$, at least, with two exact decimal digits. Is this the precision you wanted?
   b) The same exercise a) but using Simpson's rule, and looking for four exact decimals.
3. a) Verify that, if you use Simpson's rule with four subintervals, you can approximate $\log(2) = \int_1^2 \frac{dx}{x}$, at least,with two exact decimals. Find the approximation.
   b) Find a bound for the error obtained with ten subintervals, and compare it with the exact value of the integral. Are compatible the error and the bound of the error. What is the true error?
   c) Determine the number of subdivisions over $[1, 2]$ to approximate $\log(2)$ with seven exact decimals, at least and obtain (if possible) the approximation. If you have done it, compare the result with the exacts result.
4. Let the curve $y = x^3 - 1$
   a) Calculate the area between $f(x)$ and the axis.
   b) Approximate the area with two exact decimals, using trapezoidal rule.