MATHEMATICAL ANALYSIS

L3 - EXERCISES LIST 1: **Riemann's integrals**

1. Evaluate the following integrals:

   a) $\int \frac{1-x}{\sqrt{1-x^2}}dx$ b) $\int \frac{2+3\cos(x)}{\sin^2(x)}dx$ c) $\int \frac{1+\log(x)}{3+x\log(x)}dx$ d) $\int \frac{\sin^3(x)}{\sqrt{\cos(x)}}dx$

2. Evaluate the following integrals using integration by parts:

   a) $\int x\log(x)dx$ b) $\int \arcsin(x)dx$ c) $\int e^x\sin(x)dx$ d) $\int \frac{x}{\cos^2(x)}dx$

3. Evaluate the following integrals using the adequate change of variable:

   a) $\int x\sqrt{x-5}dx$ b) $\int \frac{x^3}{1+x^8}dx$ c) $\int \frac{dx}{1+e^x}$

4. Evaluate the following Riemmann's integrals, using Barrow's rule. Apply integration by parts, substitution, or both, if it would be necessary.

   a) $\int_0^1 \frac{\sqrt{x}}{1+\sqrt{x}}dx$ b) $\int_0^2 \frac{dx}{2+\sqrt{x}}$ c) $\int_{-\pi}^{\pi} x\sin(kx)\,dx$, $k \in \mathbb{Z}$

   d) $\int_1^4 \frac{\sqrt{x}}{x(x+4)}dx$ e) $\int_0^1 \arctan(x)dx$ f) $\int_0^2 x^2e^{-x}dx$

   g) $\int_0^{\pi} e^x\cos(x)dx$ h) $\int_0^{\log(5)} \frac{e^x\sqrt{e^x-1}}{e^x+3}dx$ i) $\int_0^{\pi/2} \cos^3(x)dx$

   j) $\int_2^{\pi} \cos\left(\sqrt{x-2}\right)dx$ k) $\int_1^4 \frac{\sqrt{1+\sqrt{x}}}{\sqrt{x}}dx$ l) $\int_1^3 \frac{dx}{x\sqrt{x+1}}$

5. Evaluate the area of the region delimited by $y = x^2 + x - 2$ and the OX axis, in the interval $[-3, 2]$

6. Evaluate the area delimited by $f(x) = \frac{1}{x^2+3}$ and $g(x) = \frac{x-1}{8x}$ in the first quadrant