ISITV - First year students - GO exam first session 2013

Any printed or manuscript document allowed

All electrical devices are forbidden

Duration : two hours. The exercises are independent of each other.

Answers can be written either in french or in english.

First exercise. Using the theorem of residues, compute the integral

$$I = \int_0^{2\pi} \frac{\cos(t) + 1}{2 + \sin(t)} dt.$$

Second exercise. Justify the existence and compute the Fourier transform of

$$g(x) = |x| \mathbf{1}_{[-1,1]}(x).$$

Third exercise. Compute the knots and weights for the maximal order quadrature on the interval [-1, 0] with two knots.

**Fourth exercise**. Describe a solution of the following differential equation, using exclusively the Fourier transform on the line :

(E) 
$$y' + y = e^{-\pi x^2}.$$

Please justify a posteriori the existences of the integrals involved, even roughly.