

## Homework #3

### Problem 1

(a) Evaluate the following integrals numerically using `qromo`.

(i)  $\int_0^{\pi/2} \frac{\sqrt{x}}{\sin x} dx$

(ii)  $\int_{\pi/2}^{\infty} \frac{\sin x}{x^2} dx$

(iii)  $\int_0^{\infty} \frac{e^{-x}}{\sqrt{x}} dx$

You may also try using Gaussian Quadrature for any/all of these cases. Note that you will have to do some analytic work yourselves if you try this.

(b) One of these integrals converges much more slowly than the others. Which one? Find a simple analytic transformation of the integral that improves the convergence.

### Problem 2

Integrate

$$\int \int e^{-x \sin y} dx dy$$

over the interior of an ellipse whose boundary is given by

$$5x^2 - 6xy + 5y^2 = 2$$

to an accuracy of 1 part in  $10^5$ . Keep track of how many times you evaluate the integrand in total. How many? What is the computed integral? You may use any integration approach you wish.