

Mth 611 Assignment 5 | Name:

Bent Petersen 611s2005-005.tex Due date: Wed June 1, 2005 17:10

Instructions: Please supply your solution(s) by the due date in the space provided below. Continue on to the back of the sheet if you need more space. Do not turn in any additional paper. For additional comments and instructions check my webpage <http://oregonstate.edu/~peterseb>

Problem 5.1 Let $\rho > 1$ and the γ be the contour consisting of the interval $[-\rho, \rho]$ followed by the semicircle $|z| = \rho$, $\Im z \geq 0$. If $\beta > 0$ compute the contour integral

$$\int_{\gamma} \frac{e^{i\beta z}}{z^2 + 1} dz = \int_{\gamma} \frac{e^{i\beta z}/(z + i)}{z - i} dz.$$

By passing to the limit as $\rho \rightarrow \infty$ (be sure to justify your calculations) show that

$$e^{-\beta} = \frac{2}{\pi} \int_0^{\infty} \frac{\cos \beta x}{x^2 + 1} dx.$$