

Theoretical Physics
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Chapter T Homework. Poles and the Residue Theorem

T1. An Integration Along the x-axis.

Use residues to evaluate $I = \int_{-\infty}^{\infty} \frac{e^{imx} dx}{x^2 - 3ix - 2}$ where $m > 0$.

After you get your answer for $I = I(m)$, make it look as elegant as possible. Then give your formula when $m = 1$ in terms of the constants such as π , e , and integers. Finally, what actual numerical value to the nearest 0.01 do you get when $m = 1$, using a calculator with numerical values for your constants?

T2. An Angle Integration.

Consider the integral $I = \int_0^{2\pi} \frac{d\theta}{5 + 3\cos\theta}$.

Let $z = Re^{i\theta}$ where $R = 1$ so that you have a circular integral path in the complex plane with unit radius. Get everything in terms of z . Then use the residue theorem to obtain your answer. Give your final answer for this integral in the most elegant form in terms of π .