Student handout

Find the Fourier transform of a plane wave.

1 Instructor's Guide

1.1 Introduction

If students know about the Dirac delta function and its exponential representation, this is a great second example of the Fourier transform that students can work out in-class for themselves.

Students will need a short lecture giving the definition of the Fourier Transform

$$\mathcal{F}(f) = \tilde{f}(k) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-ikx} f(x)\, dx \tag{1}$$

1.2 Student Conversations

Students may ask what is meant by a plane wave. Help them figure out what is meant, from the context or give them the formula if time is tight.

Keep the time dependence in or leave it out depending on how much time you have to deal with a little extra algebraic confusion.

1.3 Wrap-up

This example is (almost) the inverse of Fourier Transform of the Delta Function. If you really want the inverse problem, change the prompt to "Find the inverse Fourier transform of a plane wave."