

PHYSICS 502
2nd HOMEWORK
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Hand in: Sunday 17th March 2013

1. Find the Fourier transform of the triangular pulse:

$$g(x) = \begin{cases} h(1 - a|x|), & |x| < 1/a, \\ 0, & |x| > 1/a. \end{cases}$$

2. Find the Fourier transform of the function $f(t) = e^{-a|t|}$ ($a > 0$);
3. A rectangular pulse is described by

$$g(t) = \begin{cases} 1, & |t| < d/2 \\ 0, & |t| > d/2 \end{cases}.$$

Show that the Fourier exponential transform is

$$G(\omega) = d \frac{\sin(\omega d / 2)}{(\omega d / 2)}.$$

Here is the single slit diffraction problem of physical optics. The slit is described by $g(t)$. The diffraction pattern *amplitude* is given by the Fourier transform $G(\omega)$.