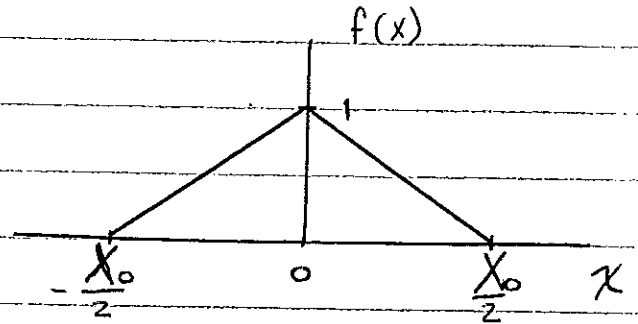


Homework - Fourier Transform

1. Determine the Fourier Transform of the function shown. Plot the result using Excel, Mathcad, or Matlab.



$$\text{Answer: } F(k) = \frac{X_0}{2} \left[\frac{\sin\left(\frac{kX_0}{4}\right)}{\left(\frac{kX_0}{4}\right)} \right]^2$$
$$= \frac{X_0}{2} \text{sinc}^2\left(\frac{kX_0}{4}\right)$$

2. Given:

$$f(x) = \begin{cases} e^{-\alpha x} & x \geq 0 \\ e^{\alpha x} & x < 0 \end{cases}$$

Determine and plot the Fourier Transform of $F(x)$

3. Show that $\mathcal{F}\left\{\frac{df(x)}{dx}\right\} = -ik F(k)$