

ECE 330  
Spring 2008  
Exam #2

Name: Solutions

Important Note: To receive full credit, you must show all your work and fully justify your answers.

1) Consider the signal  $x(t)$  with Fourier transform

$$X(\omega) = u(1 - \omega^2).$$

Evaluate the following expressions:

a)  $\mathcal{F}\{x(5 - 3t)\}$

From the time-shift and time-scaling properties,

$$x(t) \leftrightarrow X(\omega)$$

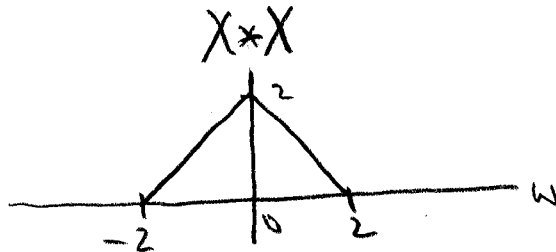
$$x(t+5) \leftrightarrow e^{j5\omega} X(\omega)$$

$$x(-3t+5) \leftrightarrow \frac{1}{3} e^{j5(-\frac{\omega}{3})} X(-\frac{\omega}{3}) = \frac{1}{3} e^{-j\frac{5}{3}\omega} u(1 - \frac{\omega^2}{9})$$

b)  $\mathcal{F}\{x^2(t)\}$

From the modulation property,

$$x^2(t) \leftrightarrow \frac{1}{2\pi} X(\omega) * X(\omega)$$



$$x^2(t) \leftrightarrow \begin{cases} 2 + \omega, & -2 \leq \omega \leq 0 \\ 2 - \omega, & 0 \leq \omega \leq 2 \\ 0, & \text{else} \end{cases} = (2 - |\omega|) u(4 - \omega^2)$$







