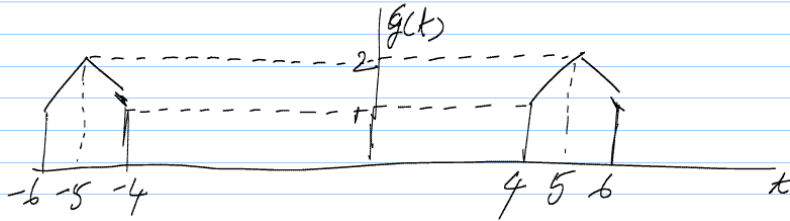


WEDNESDAY QUIZ 1

Note Title

2/11/2008

FIND THE FOURIER TRANSFORM OF THE FOLLOWING SIGNAL



$$\text{RECT}(t) \Rightarrow \text{sinc}(f)$$

$$\begin{aligned} \text{RECT}(t) &= 1 \text{ IF } |t| < \frac{1}{2} \\ &= 0 \text{ OTHERWISE} \end{aligned}$$

~~$$\text{RECT}(t) * \text{RECT}(t) = 1$$~~

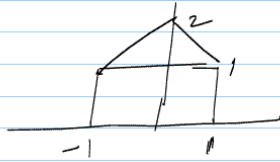
$$\text{RECT}(t) * \text{RECT}(t) = \text{TRIANG}(t)$$

$$\begin{aligned} \text{TRIANG}(t) &= 1 - |t| \text{ FOR } |t| < 1 \\ &= 0 \text{ OTHERWISE} \end{aligned}$$

CONSIDER $\text{RECT}(t/2) = 1$ IF $|t| < 2/2$
 $= 0$ OTHERWISE



LET $house(t) = rect(t/2) + triang(t)$



$$rect(t) \iff sinc(f)$$

SCALING $rect(t/2) \iff 2sinc(2f) \rightarrow \textcircled{1}$

$$rect(t) * rect(t) = triang(t)$$

CONVOLUTION $rect(t) * rect(t) \iff sinc^2(f)$

$$\therefore triang(t) \iff sinc^2(f) \rightarrow \textcircled{2}$$

COMBINING $\textcircled{1}$ & $\textcircled{2}$,

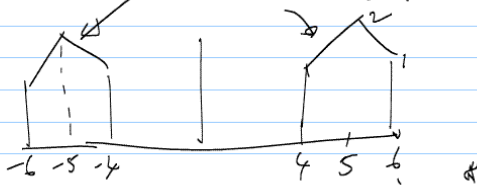
$$house(t) \iff House(f) = 2sinc(2f) + sinc^2(f)$$

TIME SHIFTING $house(t-5) \iff House(f) \exp(-j2\pi f 5)$

) $house(t+5) \iff House(f) \exp(j2\pi f 5)$

$$\therefore house(t-5) + house(t+5) \iff House(f) 2 \cos(10\pi f)$$

$$= [2sinc(2f) + sinc^2(f)] 2 \cos(10\pi f)$$



The image shows a grid of 18 horizontal blue lines and 1 vertical red line. The vertical red line is positioned on the left side, and the horizontal blue lines are spaced evenly across the page. This layout is typical for a table or a list of items.