

# Solution

ECE103\_F18 Quiz 5, November 5, 2018

Name \_\_\_\_\_ Student ID No. \_\_\_\_\_

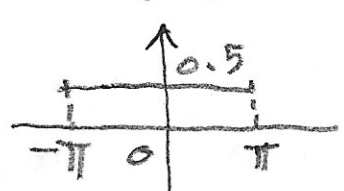
This quiz tests your understanding of Fourier Transform (FT) and their inverse transforms ( $FT^{-1}$ ) to real-time signal processing. The table on the next page shows transform pairs relevant to this quiz problem.

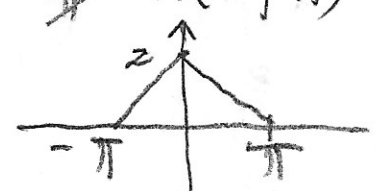
Let  $y(t) = x(t) * z(t)$ ,

where  $x(t) = 0.5 \text{ sinc}(\pi t)$ ,  $z(t) = \text{sinc}^2(\pi t/2)$ .

Find  $y(t)$ . (Hint: It would be helpful to use  $X(\omega)$  and  $Z(\omega)$  to find  $Y(\omega)$  first, then use  $FT^{-1}$  to find  $y(t)$ .)

$$Y(\omega) = X(\omega) \cdot Z(\omega)$$

$$X(t) = 0.5 \text{ sinc}(\pi t) \longleftrightarrow \begin{matrix} \uparrow \\ \beta = \pi \\ A = 0.5 \end{matrix} 0.5 \text{ rect}(\omega/2\pi) = X(\omega)$$


$$Z(t) = \text{sinc}^2(\pi t/2) \longleftrightarrow \begin{matrix} \uparrow \\ T = \pi \end{matrix} \frac{2\pi}{\pi} \text{tri}(\omega/\pi)$$


$$Y(\omega) = X(\omega) Z(\omega) = \underline{Z(\omega)}, \text{ for } X(\omega) = 1 \quad -\pi < \omega < \pi$$

$$\text{thus, } y(t) = z(t) = \underline{\text{sinc}^2(\pi t/2)}$$

(ans)