2022sep07

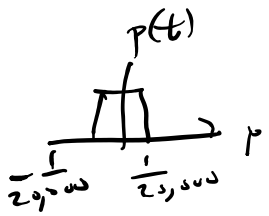
Wednesday, September 7, 2022 13:28

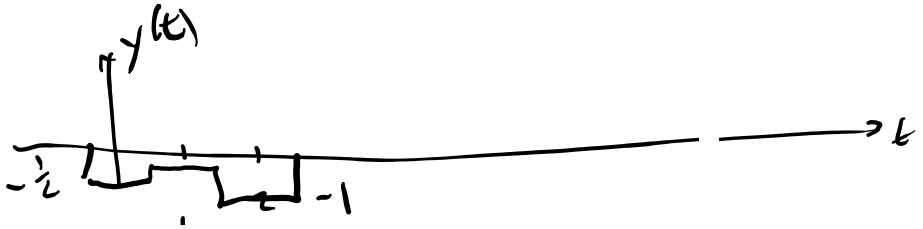
Given $y[n] = [-0.5, -0.3, -1]$,

Find $y(t)$ using $T_s = \frac{1}{10,000}$ second

(a) PWC interpolation

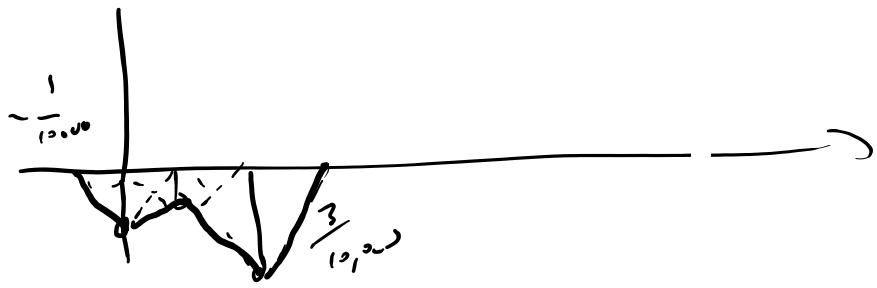
$$y(t) = \sum y[n]\, p(t - nT_s)$$



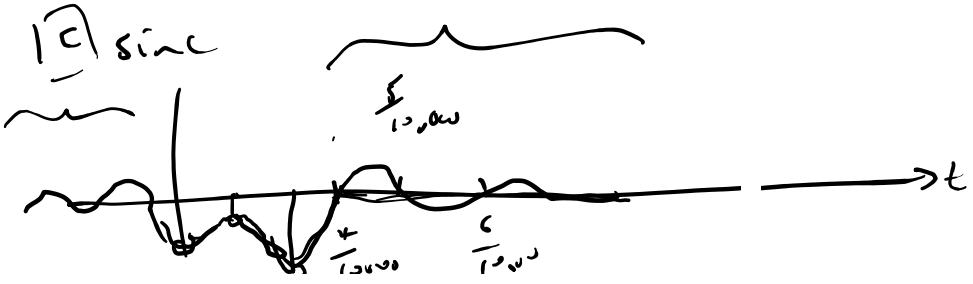


1/10,000 1/10,000

(b) PWL

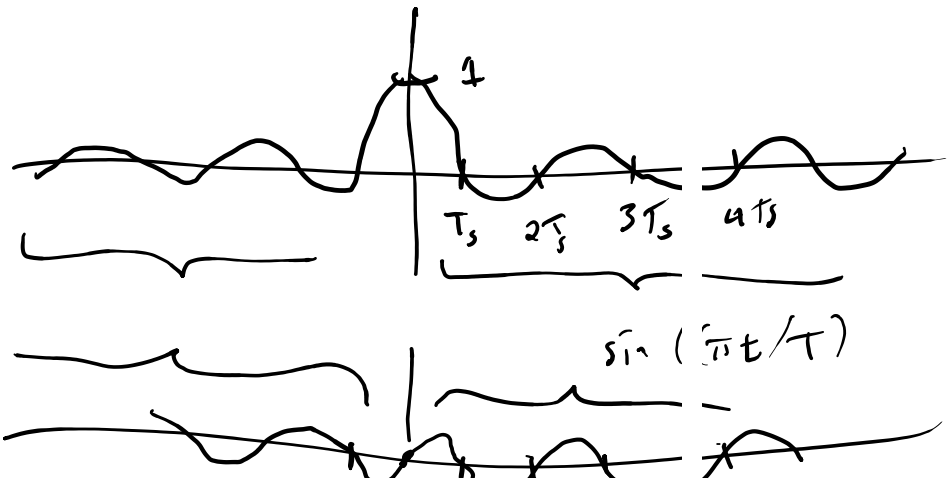


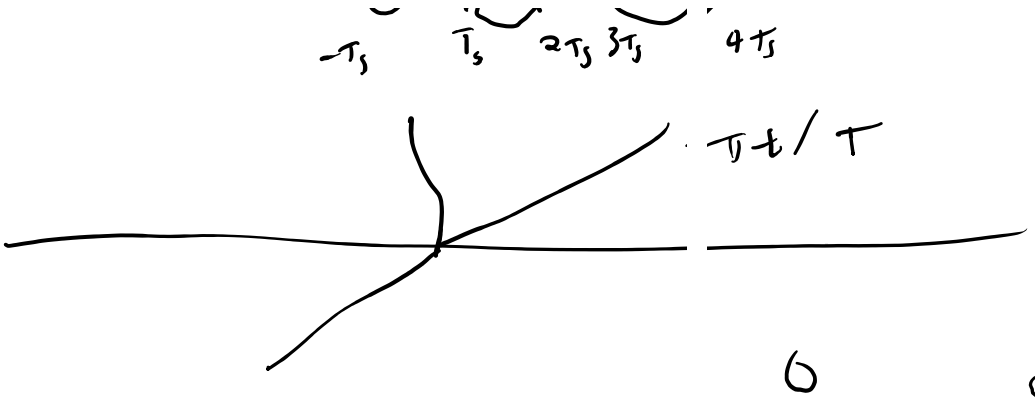
(c) sinc



$$y(t) = \sum_n y[n]\, p(t - nT_s)$$

$$p(t) = \frac{\sin(\pi t/T)}{(\pi t/T)} \qquad \frac{d^n p(t)}{dt^n} \text{ is continuous for all } n$$





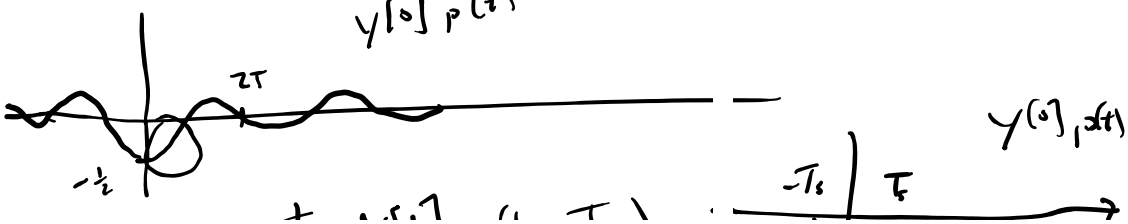
$$p(t) = \frac{\sin(\frac{\pi t}{T})}{\frac{\pi t}{T}} = \frac{\frac{\pi t}{T} - \frac{1}{3!}\left(\frac{\pi t}{T}\right)^3 + \frac{1}{5!}\left(\frac{\pi t}{T}\right)^5 - \cdots}{\frac{\pi t}{T}}$$

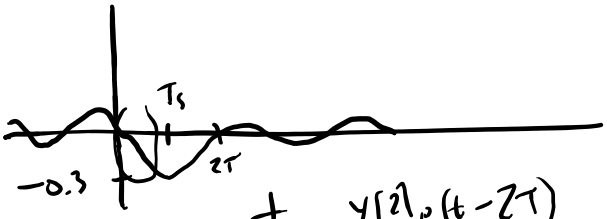
$$\xrightarrow[t \to 0]{} \boxed{1}$$

$$p(t) = \underline{\text{sinc}}\left(\frac{\pi t}{T}\right) \equiv \frac{\sin\left(\frac{\pi t}{T}\right)}{\left(\frac{\pi t}{T}\right)}$$

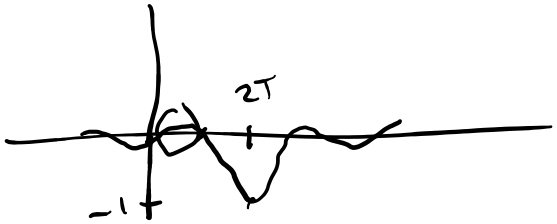
$$\text{np.sinc}(t) = \frac{\sin(\pi t)}{\pi t}$$

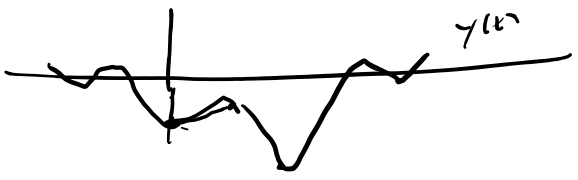
$$y(t) = \sum y[n]\, p(t - nT_s)$$



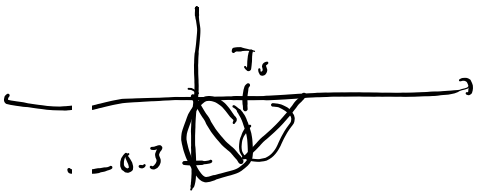


+ y[2] p(t-2T)

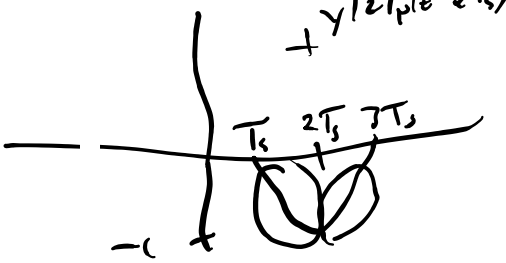




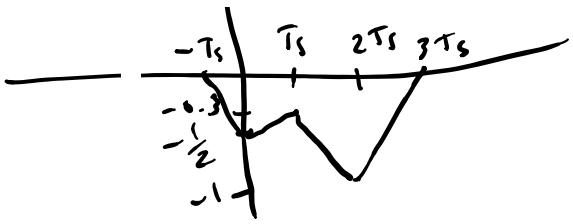
+ y[1] p(t-Ts)



+ y[2] p(t-2Ts)



y(t)


$-T_s$
T_s
$2T_s$
$3T_s$
-0.3
$-1/2$
-1