EE3900 - Oppenheim and Wilsky A2

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Question 2.22 (e)

For each of the following pairs of waveforms, use the convolution integral to find the response y(t) of the LTI system with impulse response h(t) to the input x(t). Sketch your results.
part (e): x(t) and h(t) are as in Figure P2.22(c).

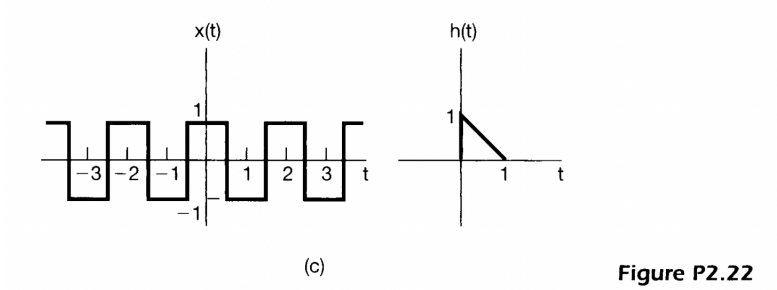

Figure 1: 3.16

As we can see in the figure, $x(t)$ is a periodic function, which implies $y(t)$ is also periodic. This means we only have to find out one period. We have,

$$\text{y(t)} = \begin{cases} \int_{t-1}^{\frac{-1}{2}} (t-\tau-1)\,d\tau + \int_{\frac{-1}{2}}^{t} (1-t+\tau)\,d\tau = \frac{1}{4}+t-t^2 & \frac{-1}{2} < t < \frac{1}{2} \\ \int_{t-1}^{\frac{1}{2}} (1-t+\tau)\,d\tau + \int_{\frac{1}{2}}^{t} (t-1-\tau)\,d\tau = t^2-3t+\frac{7}{4} & \frac{1}{2} < t < \frac{3}{2} \end{cases}$$

As proved in the equation above, the period of $y(t)$ is 2.