

Example 3.20. Determine whether the system \mathcal{H} is causal, where

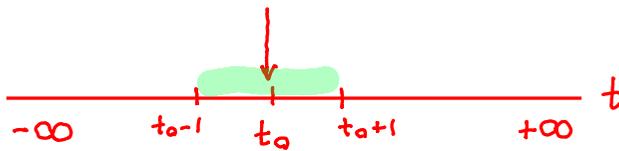
$$\mathcal{H}x(t) = \int_{t-1}^{t+1} x(\tau) d\tau.$$

Solution. Consider the calculation of $\mathcal{H}x(t_0)$ for arbitrary t_0 . We have

$$\mathcal{H}x(t_0) = \int_{t_0-1}^{t_0+1} x(\tau) d\tau.$$

Thus, we can see that $\mathcal{H}x(t_0)$ only depends on $x(t)$ for $t_0 - 1 \leq t \leq t_0 + 1$. Since some of the values in this interval are greater than t_0 (e.g., $t_0 + 1$), the system is **not causal**. ■

Consider computation
of output at this point



at which points must
input be known?