

Problem 10

In each of Problems 7 through 12:

- (a) Sketch the graph of the given function.
- (b) Express $f(t)$ in terms of the unit step function $u_c(t)$.

$$f(t) = \begin{cases} t^2, & 0 \leq t < 2, \\ 1, & t \geq 2. \end{cases}$$

Solution

Write $f(t)$ in terms of the Heaviside function, $H(t)$, which is defined to be 1 if $t > 0$ and 0 if $t < 0$.

$$\begin{aligned} f(t) &= t^2[H(t) - H(t - 2)] + 1H(t - 2) \\ &= t^2H(t) + (1 - t^2)H(t - 2) \\ &= t^2u_0(t) + (1 - t^2)u_2(t) \end{aligned}$$

