Problem 9

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 $u_c(t)$.

$$f(t) = \begin{cases} 1, & 0 \le t < 2, \\ e^{-(t-2)}, & t \ge 2. \end{cases}$$

Solution

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

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