

## Problem 11

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  $u_c(t)$ .

$$f(t) = \begin{cases} t, & 0 \leq t < 1, \\ t - 1, & 1 \leq t < 2, \\ t - 2, & 2 \leq t < 3, \\ 0, & t \geq 3. \end{cases}$$

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### Solution

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

$$\begin{aligned} f(t) &= t[H(t) - H(t - 1)] + (t - 1)[H(t - 1) - H(t - 2)] + (t - 2)[H(t - 2) - H(t - 3)] \\ &= tH(t) - H(t - 1) - H(t - 2) - (t - 2)H(t - 3) \\ &= tu_0(t) - u_1(t) - u_2(t) - (t - 2)u_3(t) \end{aligned}$$

