MAT337H1, Introduction to Real Analysis: additional recommended problem for Mar 3 class

Define a function f on $[0, 3]$ by

$$f(x) = \begin{bmatrix} 1, & \text{if } x \in [1, 2] \\ 0, & \text{if } x \notin [1, 2]. \end{bmatrix}$$

Prove, using the definition of integral, that

$$\int_0^3 f(x)dx = 1.$$