

Unit 3 Lesson 4

We are interested in two functions:

The Heaviside step function, defined by

$$f(x) = \begin{cases} 1 & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases} = u(x)$$

• Delta ^{δ} functions, which apply a set amount of force instantly
• it is defined that

$$u'(t) = \delta(t)$$

The Heaviside step is undefined at 0

We also define the box function

$$u_{ab}(t) = \begin{cases} 0 & t < a \\ 1 & a \leq t \leq b \\ 0 & t > b \end{cases}$$

$$u_{ab}(t) = u(t-a) - u(t-b)$$

$$\int_c^d \delta(t) dt = \begin{cases} 1 & \text{if } c < 0 < d \\ 0 & \text{else} \end{cases}$$

$$\delta(t) = \infty \text{ if } t=0, \text{ else.}$$

Example problems

1: $f_{alt} = (u(t-a) - u(t-b)) f(t)$

2: Break the integrand apart:

$$\int_0^5 5 \delta(t+1) dt + \int_3^5 3 \delta(t) dt + \int_{-25}^0 t^2 \delta(t-5) dt + \int_0^1 t \delta(t-20) dt$$

$$0 + 3 + 25 + 0$$

28, C.

3: (a)

