

Unit Impulse Response: Post-initial Conditions

Quiz: Consider the equation

$$\dot{w} + kw = \delta(t)$$

with rest initial conditions, $w(0^-) = 0$.

For the solution $w(t)$ what is $\dot{w}(0^+)$?

Choices:

- a) $\dot{w}(0^+) = 0$
- b) $\dot{w}(0^+) = -1/k$
- c) $\dot{w}(0^+) = -1$
- d) $\dot{w}(0^+) = -k$
- e) None of these.

Answer: (d).

Using the DE we get $\dot{w}(0^+) + kw(0^+) = \delta(0^+)$. We know $w(0^+) = 1$ and $\delta(0^+) = 0$. Therefore $\dot{w}(0^+) = -k$.

We could also look at the solution $w(t) = e^{-kt}$ for $t > 0$. Thus $\dot{w}(t) = -ke^{-kt}$ for $t > 0$. This implies $\dot{w}(0^+) = -k$.

Using the solution to the DE probably seems easier than the first method, but it is important to be able to draw conclusions without knowing the solution.

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