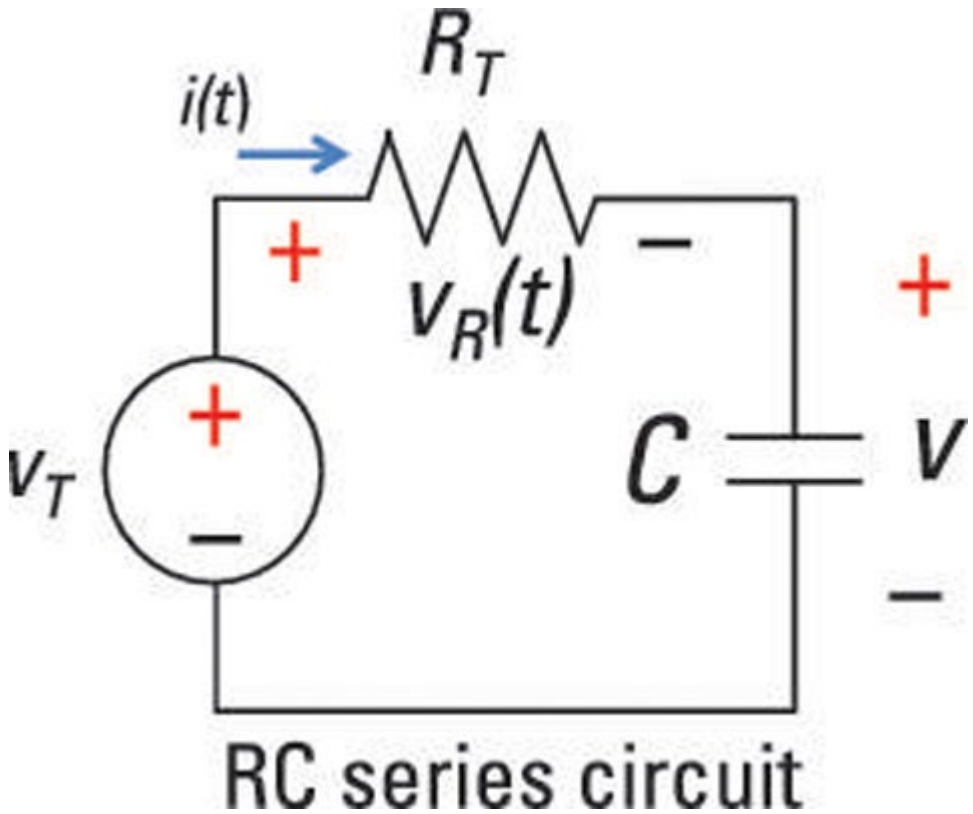
Linear Shift Invariant (LSI) Systems

Input is $V_T(t)$, which in general is a function of time.

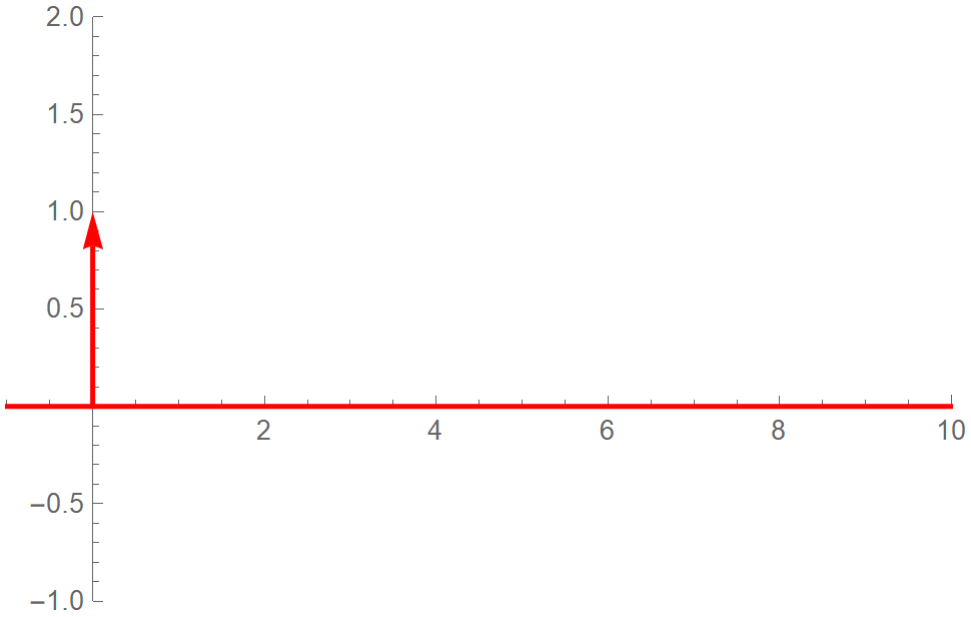


Output is $V(t)$, which will also vary with time.

If we assume this system is LSI, then determining the output for a complex input becomes easy.

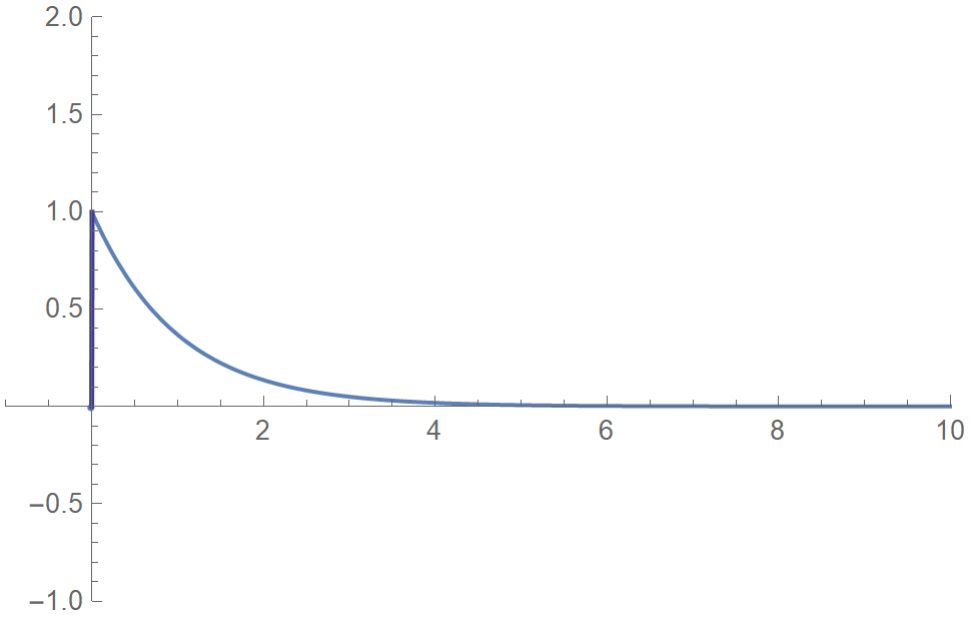
Impulse Response

$Input\ V_T(t)$



Input is a delta function

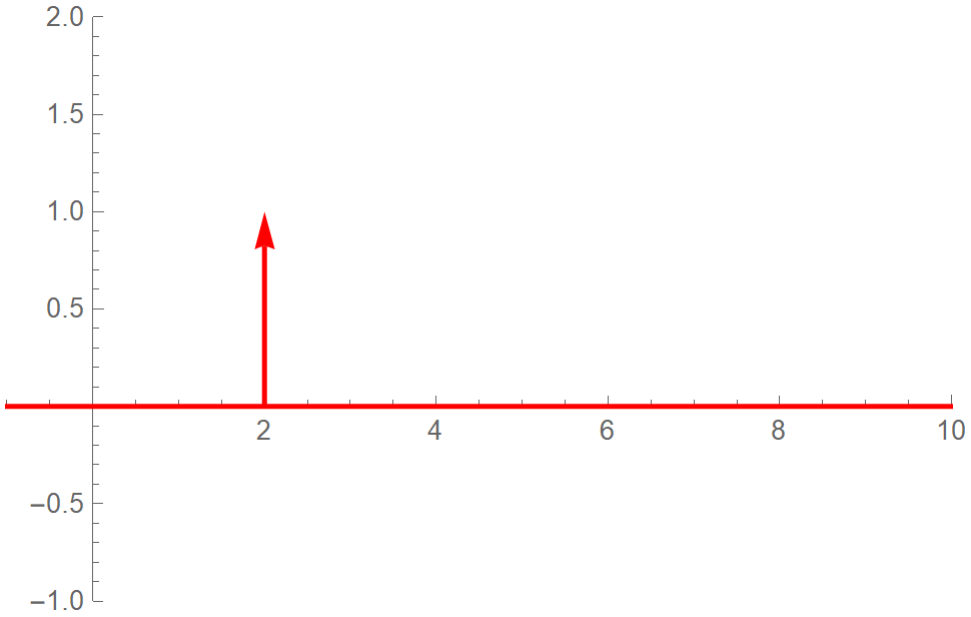
$Output\ V(t)$



Output is known as the *impulse response*.

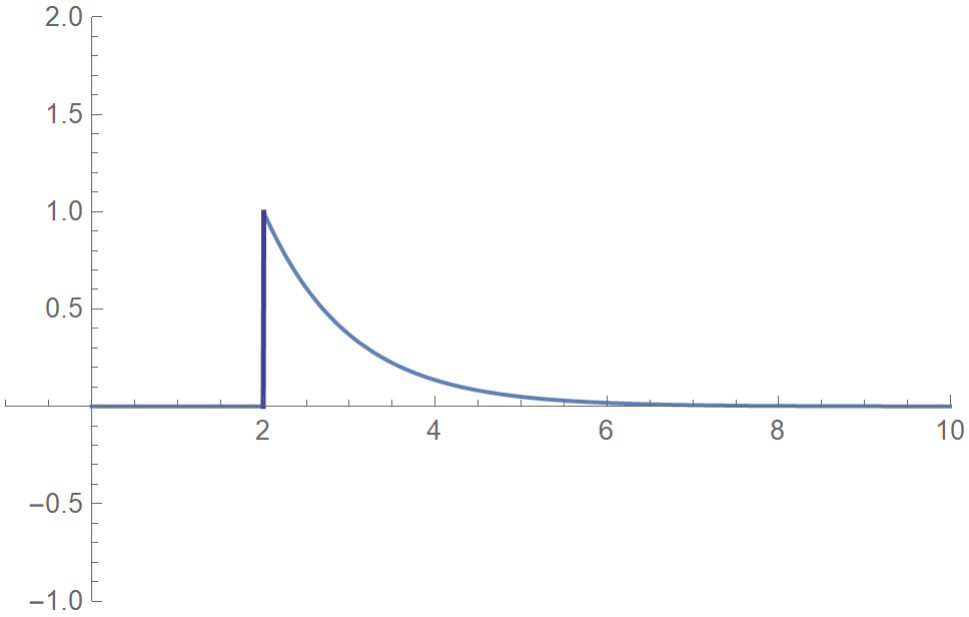
Shift Invariance

$Input\ V_T(t)$



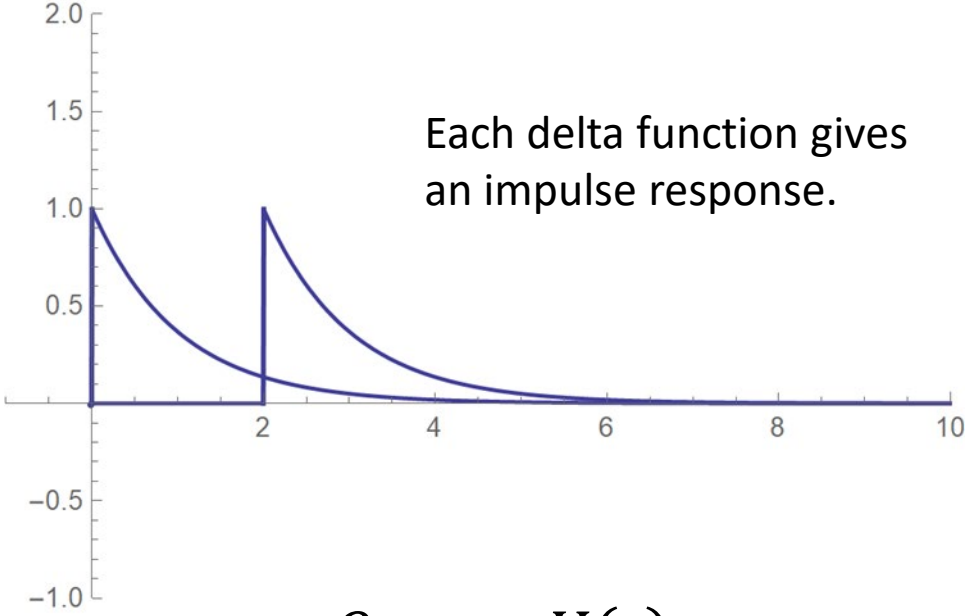
Input is a shifted delta function

$Output\ V(t)$



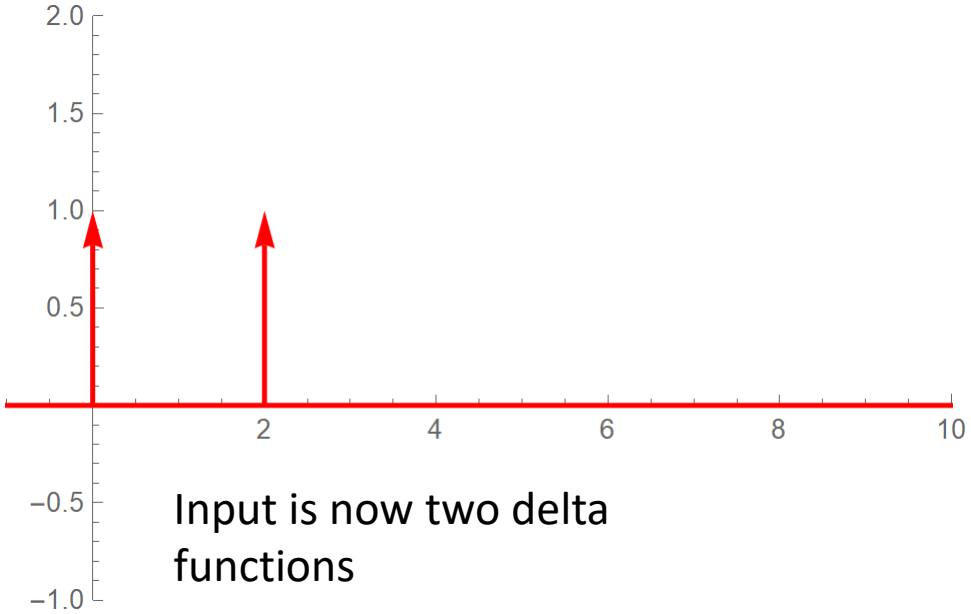
Output is the *impulse response* shifted by same amount.

Linearity



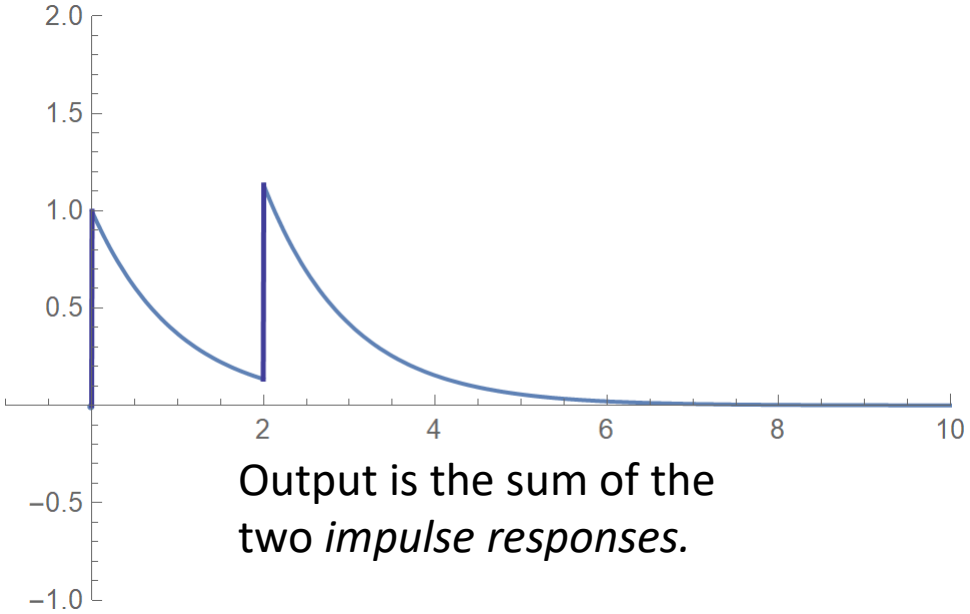
Each delta function gives an impulse response.

$Input\ V_T(t)$



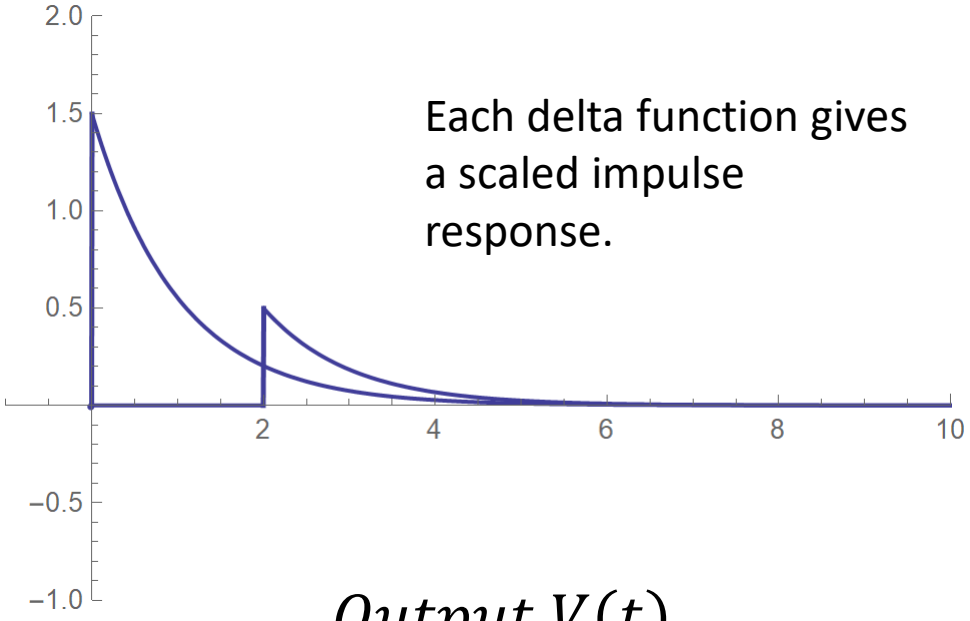
Input is now two delta functions

$Output\ V(t)$



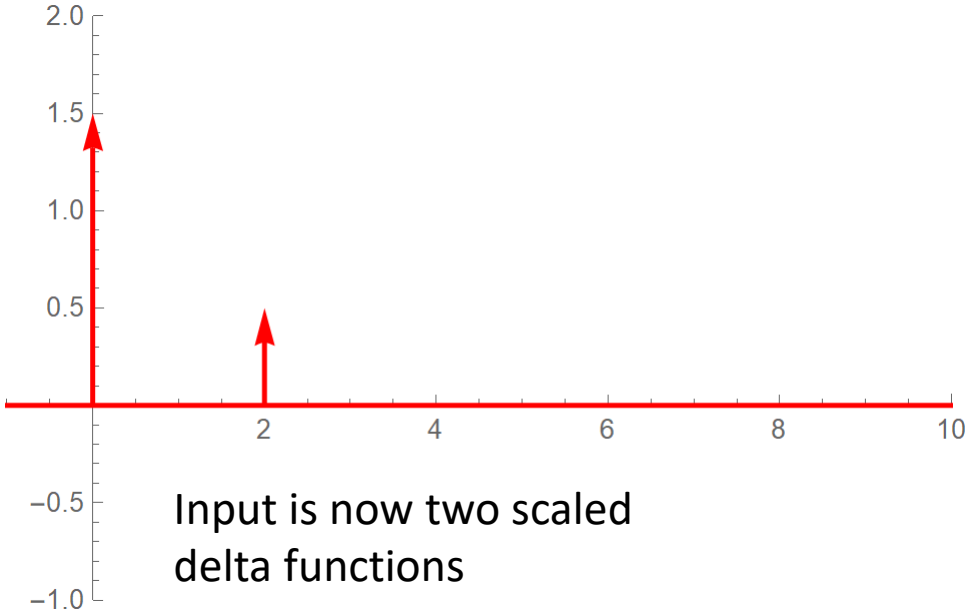
Output is the sum of the two *impulse responses.*

Linearity(Scaling)



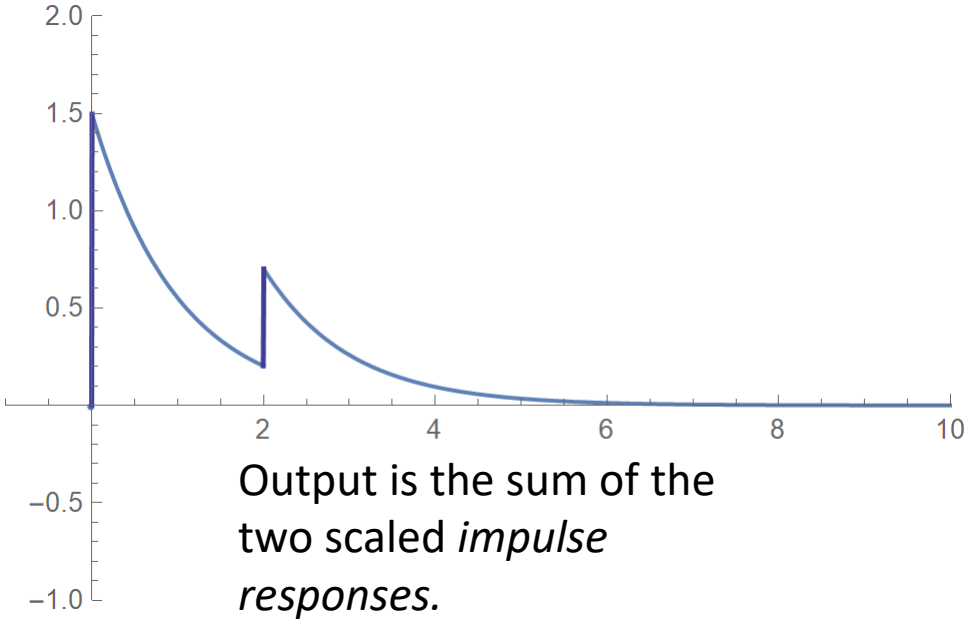
Each delta function gives a scaled impulse response.

$Input\ V_T(t)$

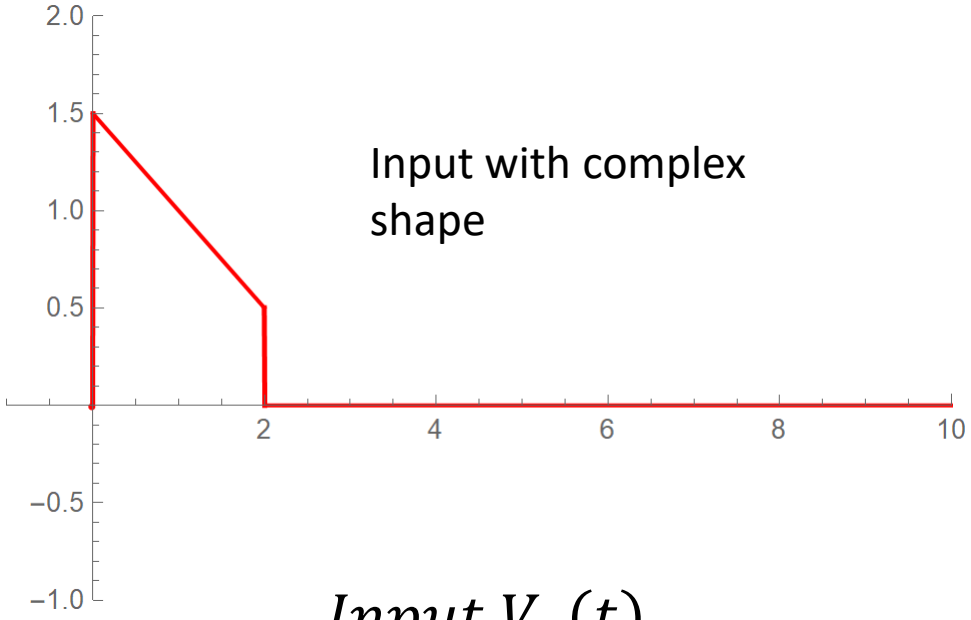


Input is now two scaled delta functions

$Output\ V(t)$

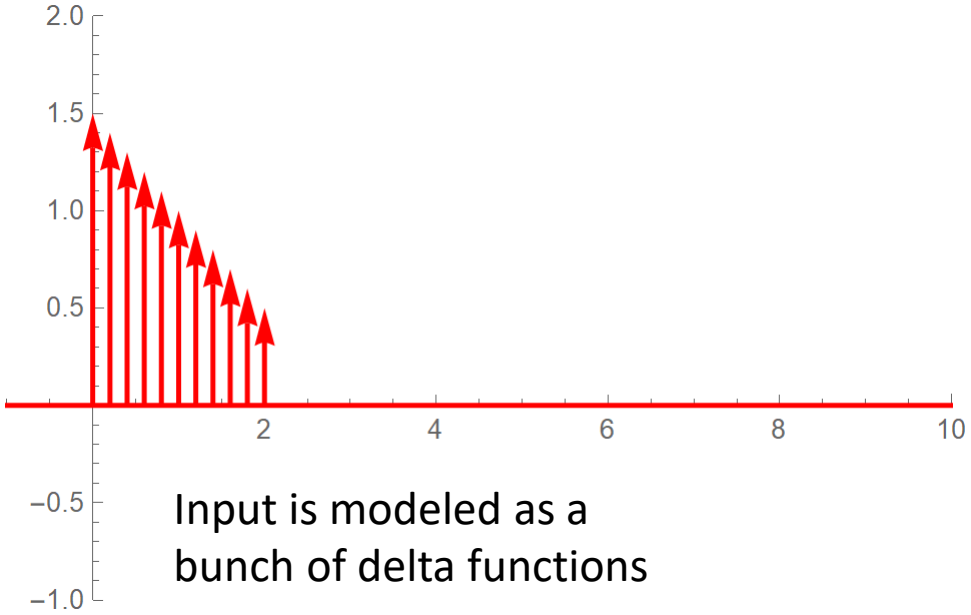


Output is the sum of the two scaled *impulse responses.*

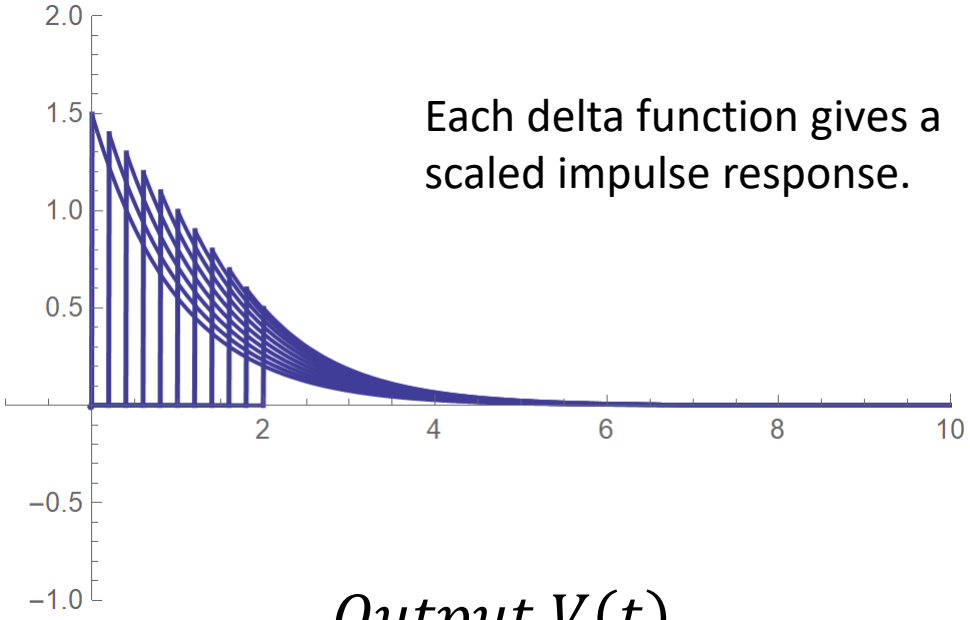


Input with complex shape

$Input\ V_T(t)$

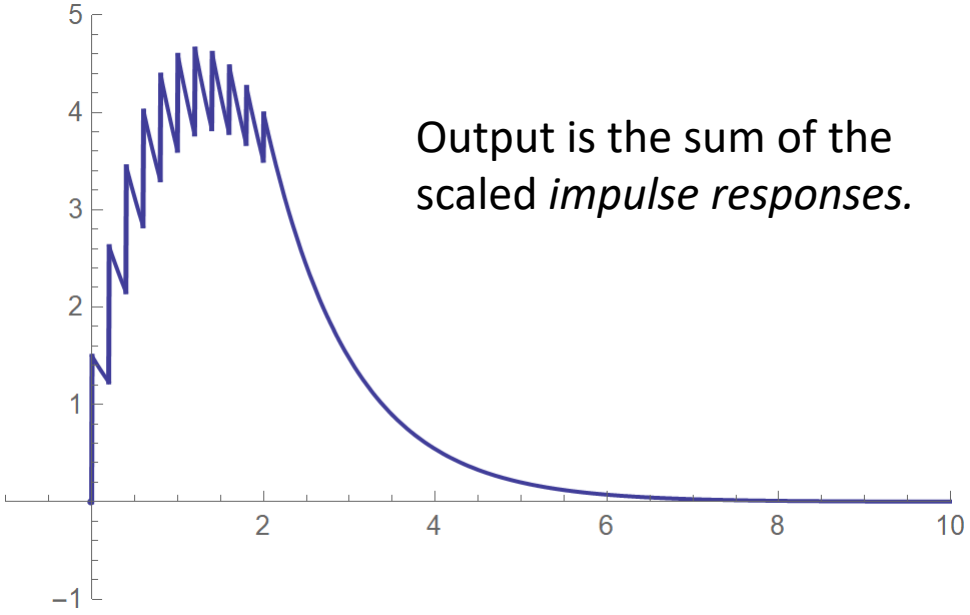


Input is modeled as a bunch of delta functions



Each delta function gives a scaled impulse response.

$Output\ V(t)$



Output is the sum of the scaled *impulse responses.*