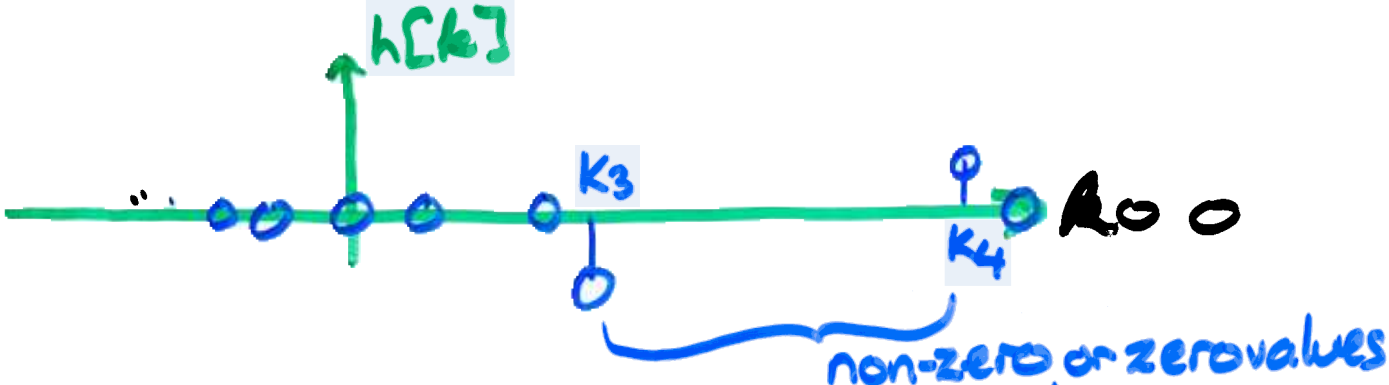
SYSTEMS WITH FINITE LENGTH INPUT, AND/OR FINITE LENGTH IMPULSE RESPONSE

How long is the output?

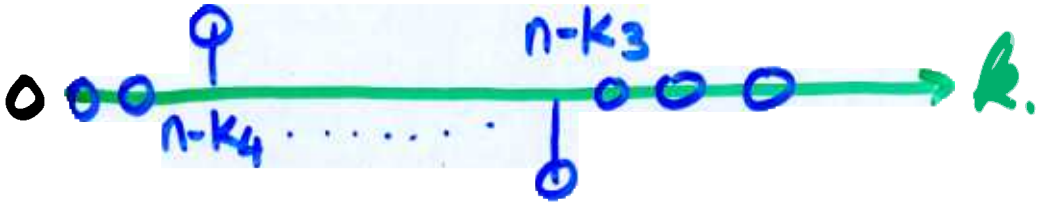
When does it start? When does it end?

non-zero or zero values in between



non-zero or zero values in between

h[n-k]



For n large and negative, $w_n[k] = 0$

$y[n] \; 0$

The first output occurs when the first overlap occurs ie $n - k_3 = k_1$

$\Rightarrow n = k_1 + k_3$

for n large and positive, $w_n[k] = 0$

$\Rightarrow y[n] = 0$

The last non-zero output occurs when the last overlap occurs ie $n - k_4 = k_2$

$n = k_2 + k_4$

- What if $k_3 < 0$?
  first output occurs before first input !
  But this is what we expect when $h[k] \neq 0$ for $k < 0$, as this is a non-causal system

- What happens as k_2 or $k_4 \to \infty$?
  What is the memory of the system ?

What is the length of x?

$L_x \quad k_2 - k_1$

What is the length of h?

$L_h = k_4 \; k_3 +$

What is the length of u?

$L_y = k_2 + k_4 \quad (k_1 + k_3) +$

$(k_2 \; k_{\#1} +) + (k_4 - k_3 +)$

$= L_x + L_h$