Lab #1: Simulation of a 1^{st} -Order System

SYSC 3600 A

Name: Youssef Ibrahim

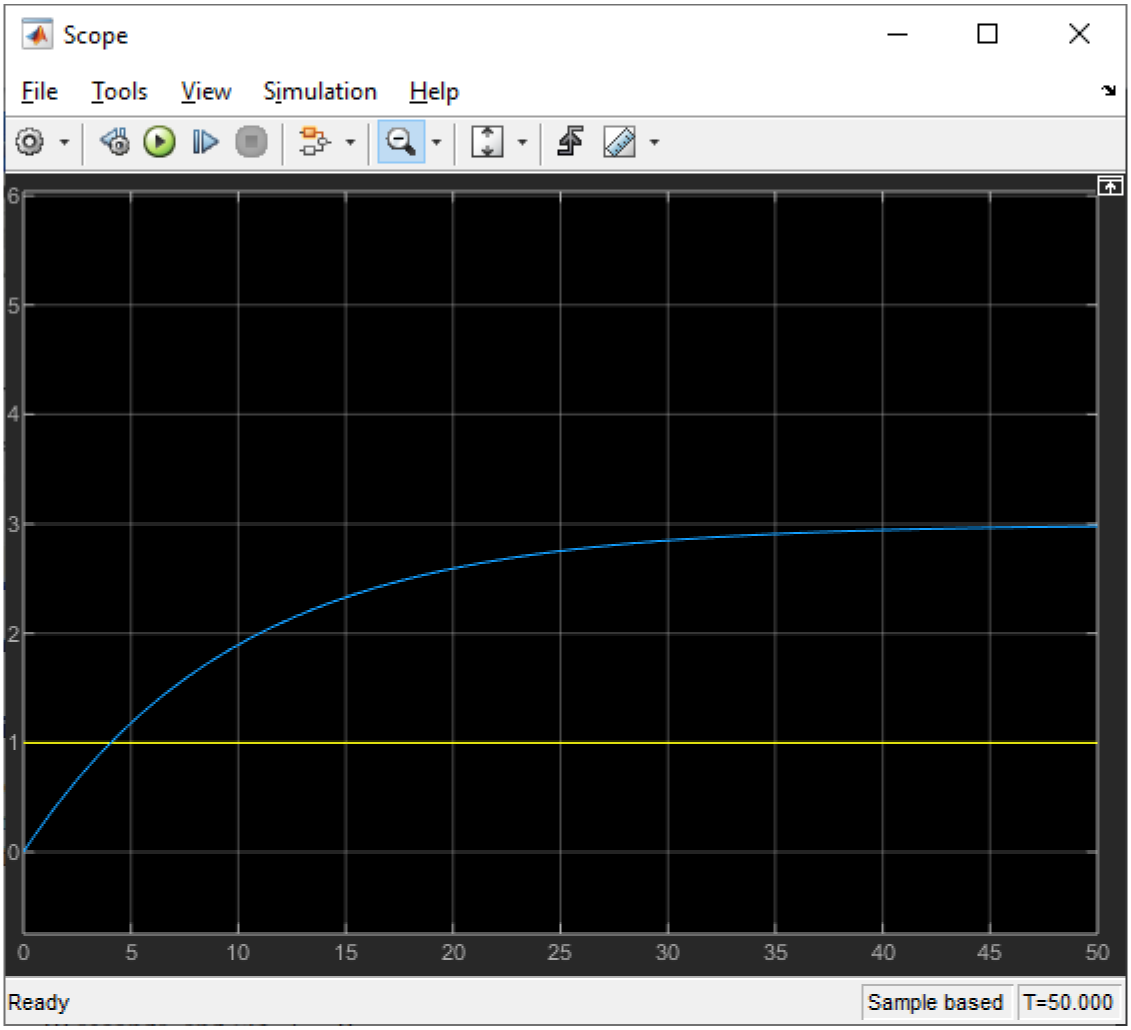
Lab Section: L3

Name: Zinah AL-Najjar

Lab Section: L5

2.2

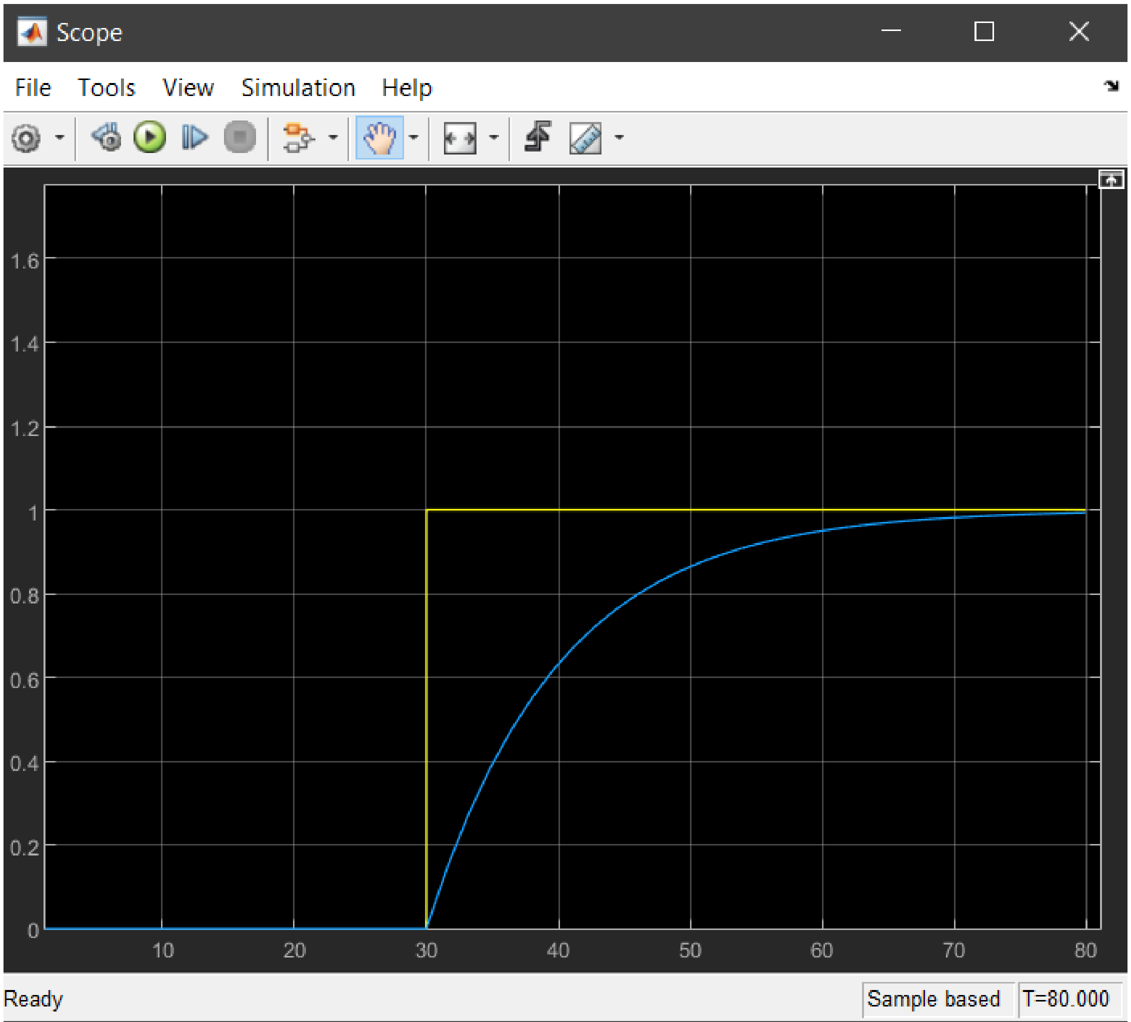
1. Sample graph: x(t) = u(t), k = 3, τ = 10 seconds, and $y(t_0^-) = 0$



The 2% settling time means that at t = 4T, the plot will try to reach to the K value but it is not touched at the value of k. K is responsible for the output gain of the system and t is responsible for the output delay of the system. Both k and t will affect the steepness of the slope of the blue function.

2.3

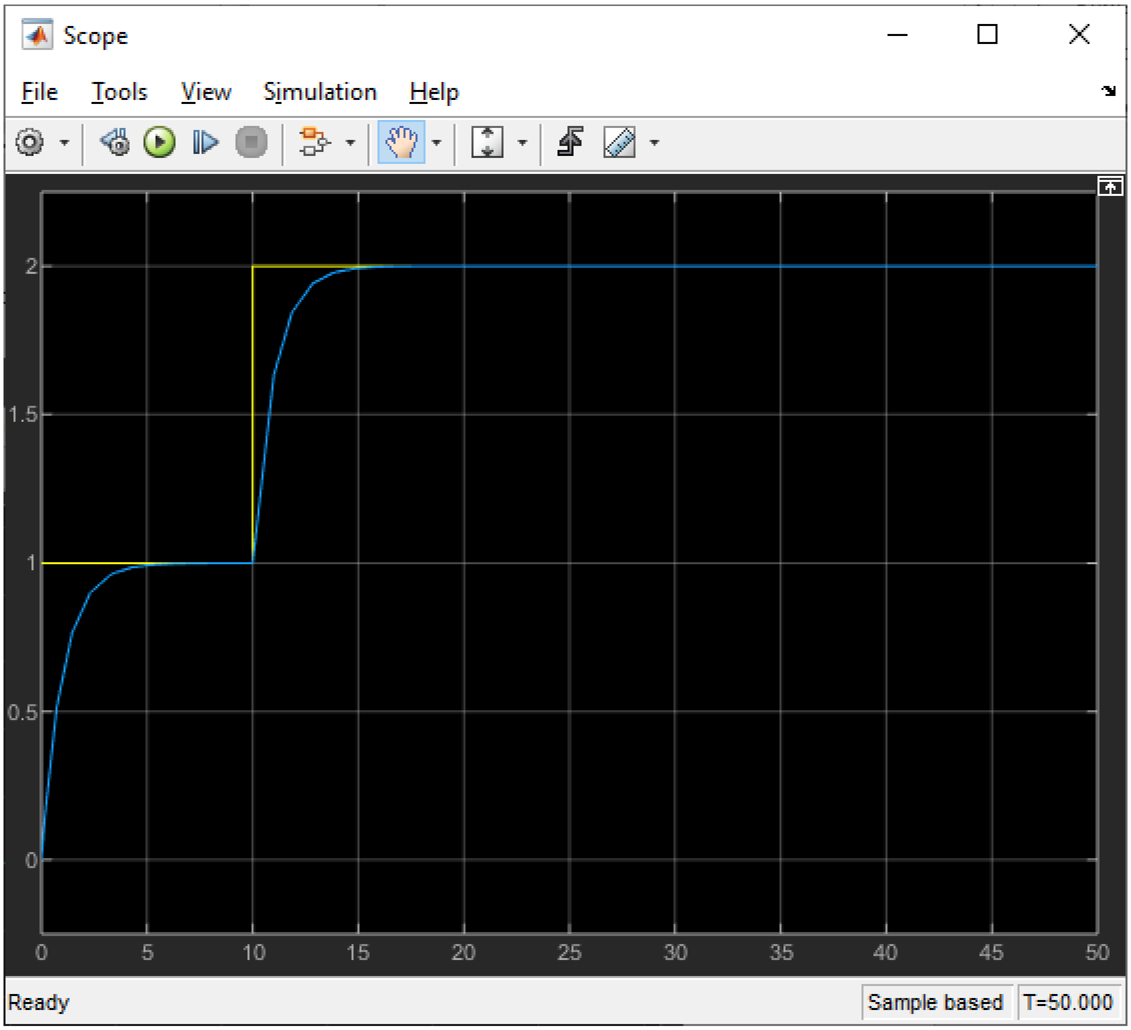
1. Sample graph: $x(t) = u(t - 30)$, $k = 1$, $\tau = 10$ seconds, and $y(t_0^-) = 0$



Setting a time delay in the input will affect the output. If the delay time is positive, then the curve is shifted to the right and if it was negative then the curve will shift to the left.

2.4

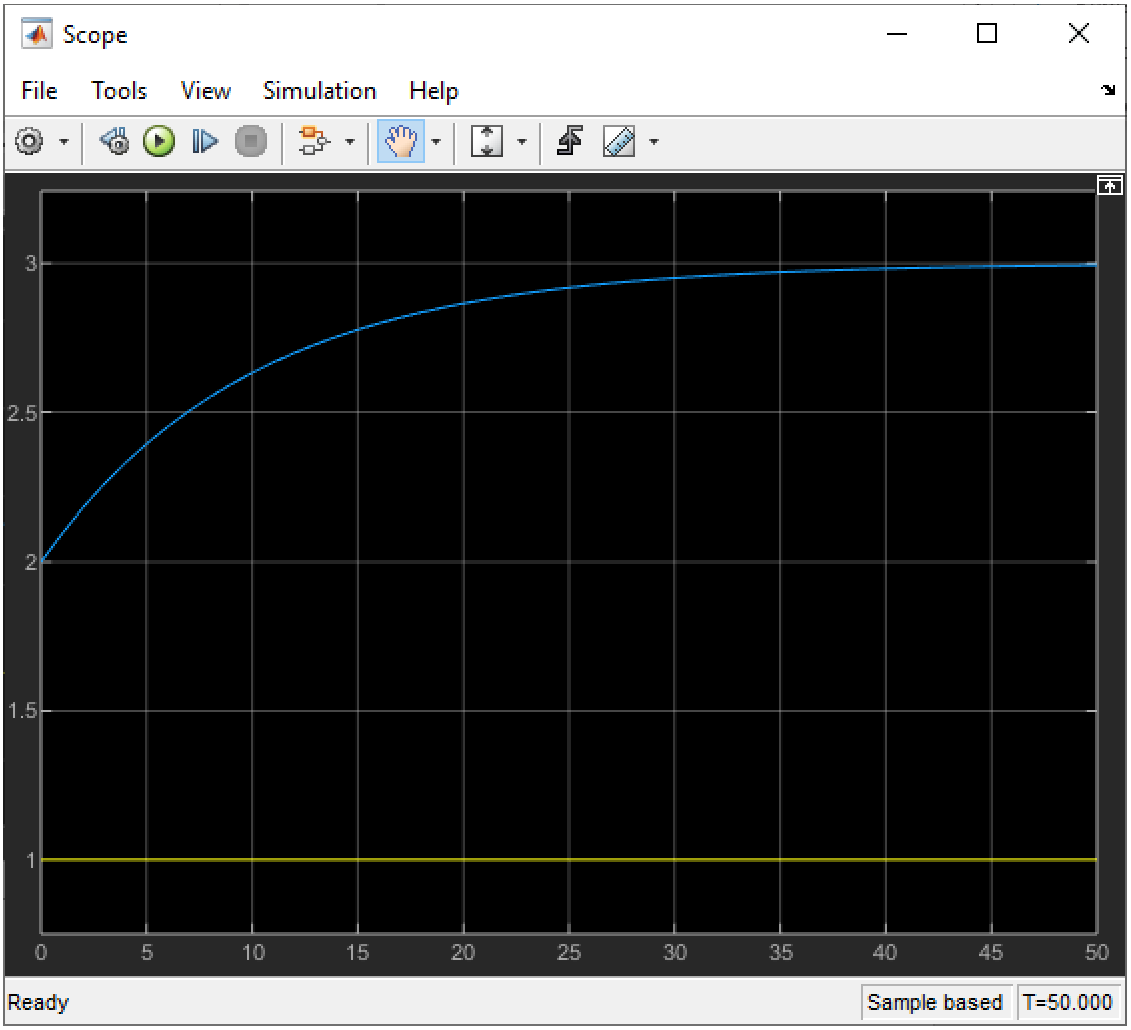
1. Sample graph: x(t) = u(t) + u(t − 10), k = 1, τ = 1 seconds, and $y(t_0^-) = 0$



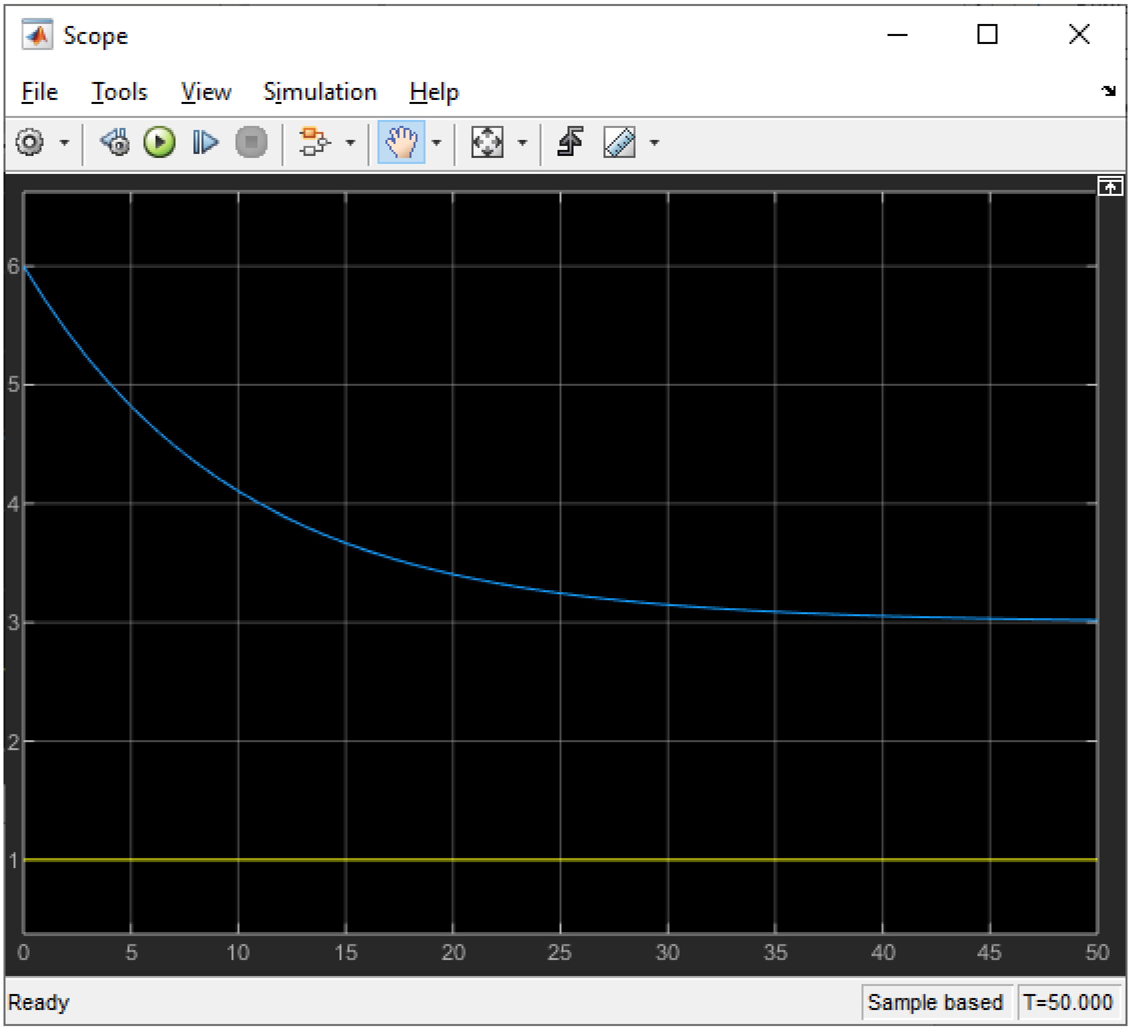
The combination of two graphs means that the input is a composite signal. If each component of the input were passed through the system separately then the response would be a curved graph and the output waveform would look the same because the two waveforms will combine.

2.5

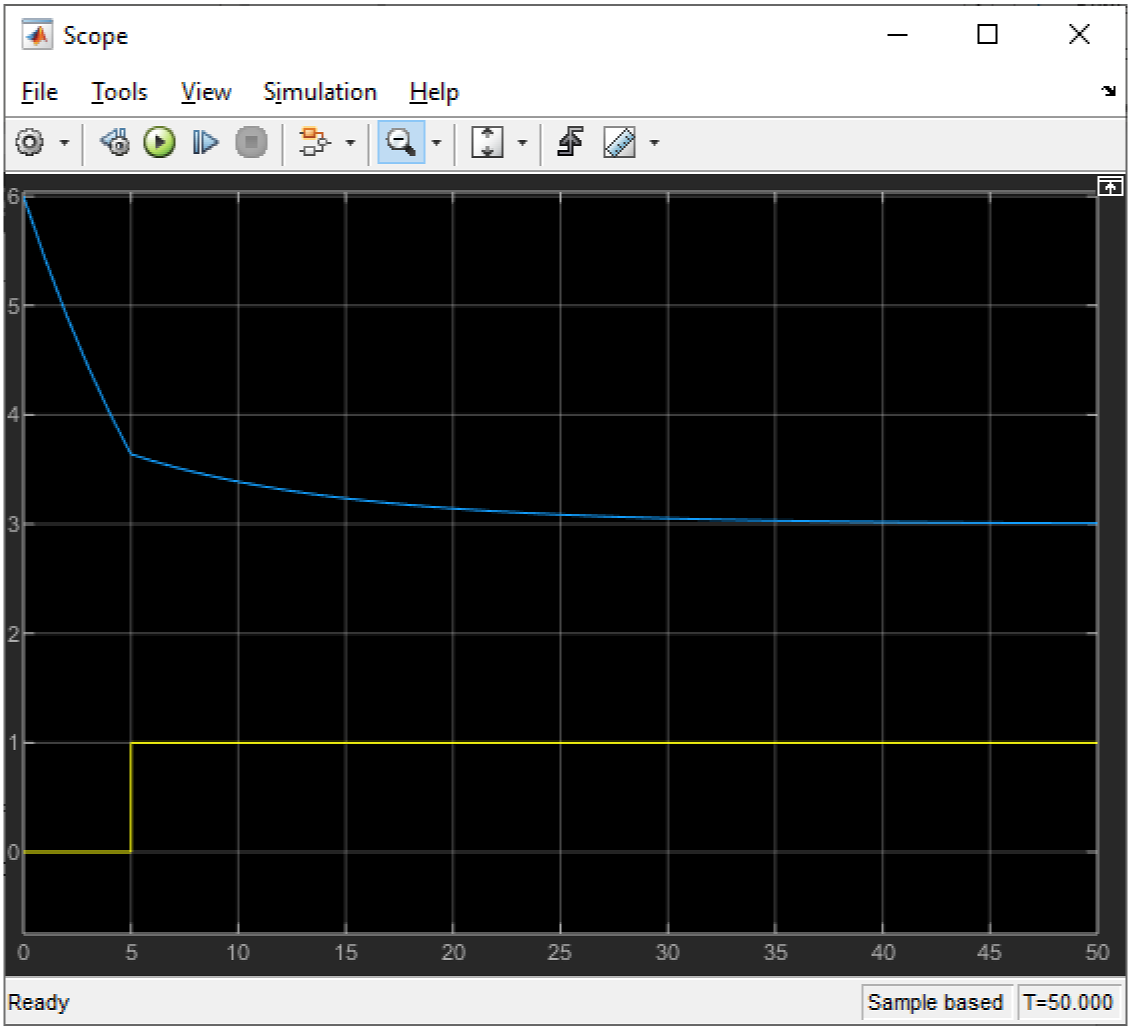
1. Sample graph: $x(t) = u(t)$, $k = 3$, $\tau = 10$ seconds, $y(t_0^-) = 2$, and $t_0 = 0$



2. Sample graph: $x(t) = u(t)$, $k = 3$, $\tau = 10$ seconds, $y(t_0^-) = 6$, and $t_0 = 0$



3. Sample graph: $x(t) = u(t - 5)$, $k = 3$, $\tau = 10$ seconds, $y(t_0^-) = 6$, and $t_0 = 0$



The initial condition affects the time taken by the system to reach steady state.

2.6

1. T= (M/b) and K = (1/b)
2. b = 0.35 and M = 0.126
3. k = e(t) / e(t) (which is K=1) and T = RC
4. output e(t) = 1, R and C controls the time constant and the output that is dependent on the input given