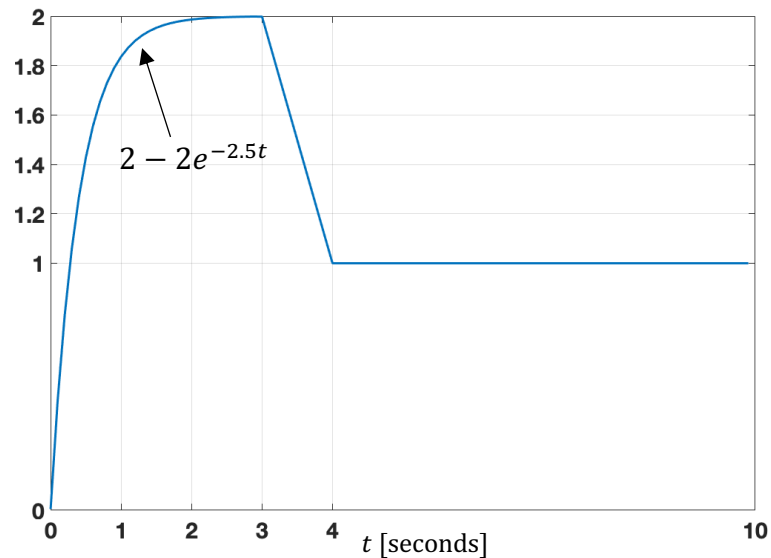


Review session

1. a) Calculate the Laplace transform of the following signal:



b) If the signal from a) is applied to the input of the system described by the transfer function $G(s) = -\frac{s-0.5}{s+1}$, determine the response of the system (in time domain).

c) Sketch the obtained response.

2. Consider the following dynamic system:

$$\ddot{y}(t) + 4\dot{y}(t) + 6.25y(t) = u(t)$$

with the initial conditions $y(0) = 1$ and $\dot{y}(0) = -2$. The input is $u(t) = H(t)$.

a) Calculate the transfer function. What is the order of the system?

b) What is the static gain? Natural frequency? Damping factor?

c) Calculate the response to the initial conditions (free response, slide 34, Laplace transform). Calculate the impulse response of the system.

3. Consider the following graph describing the unit step response for a 2nd order system without zeros. Is the system overdamped, critically damped, or underdamped? Find the transfer function. The system response reaches its first maximum at t_2 . How much is t_2 ? The system response reaches its inflection point (i.e., $\frac{d^2y}{dt^2} = 0$) at t_1 . How much is $y(t_1)$? Provide all calculus. Solution to t_2 and $y(t_1)$ should be with 5 decimals.

