Laplace Transform

Ex. 1.

Find the original function f(t) for the given transform:

$$F(s) = \frac{s^2}{s^3 - 7s + 6}$$

Ex. 2.

Find the transform F(s) for the original function:
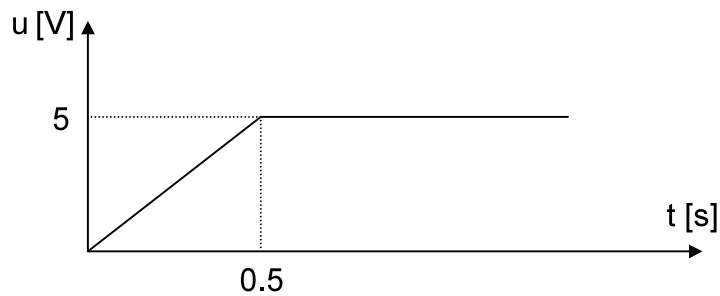
$$f(t) = t\sin(\omega t)$$

Ex. 3.

Find the original function f(t) for the given transform:

$$F(s) = \frac{1}{(s+1)^3}$$

Ex. 4.

Find the transform U(s) for the original function of the following course:

Ex. 5.

Find the transform F(s) for the original function:

$$f(t) = a \cdot 1(t) + b \cdot t \cdot \cos(at)$$

Ex. 6.
Find the original functions y(t) for the given transforms:

a) using the convolution method:

$$Y(s) = \frac{1}{s^2(s+1)}$$

b) using the method of decomposition into simple fractions:

$$Y(s) = \frac{e^{-2\pi s}}{(s^2+1)(s^2+4)}$$

Ex. 7.
Solve the following differential equations:

a) $\dfrac{d^2y(t)}{dt^2} + 4y(t) = \sin(t) - \sin(t - 2\pi)$,   initial conditions: $y(0) = \dot{y}(0) = 0$

b) $\dfrac{dy(t)}{dt} - y(t) = t\,e^{2t}$,   initial condition: $y(0) = 0$

c) $\dfrac{d^2y(t)}{dt^2} + 2\dfrac{dy(t)}{dt} + y(t) = \begin{cases} 1, & 0 \le t < 1 \\ 0, & t \ge 1 \end{cases}$,   initial conditions: $y(0) = 1,\ \dot{y}(0) = 0$

d) $\dfrac{d^2y(t)}{dt} + 4y(t) = \begin{cases} 1, & \pi \le t \le 2\pi \\ 0, & 0 \le t \le \pi \\ 0, & t \ge 2\pi \end{cases}$,   initial conditions: $y(0) = 1,\ \dot{y}(0) = 0$