

1. Find the Laplace transform of the given function

(a) $f(x) = te^{3t}$.

$$(b) f(t) = \begin{cases} e^{5t} & 0 \leq t < 6 \\ 3 & t \geq 6. \end{cases}$$

2. Find the inverse Laplace transform of

(a)
$$F(s) = \frac{3}{s^2 + 4} + \frac{5}{(s - 1)^3}.$$

$$(b) F(s) = \frac{2s^3 + 3s^2 - 8s + 12}{s^4 - 4s^2}.$$

$$(c) F(s) = \frac{2s + 1}{s^2 - 2s + 2}.$$

3. Use the Laplace transform to solve the initial value problems:

(a) $y'' + 3y' + 2y = 0$. $y(0) = 1$, $y'(0) = 0$.

$$(b) \quad y'' - 2y' + 2y = \cos t, \quad y(0) = 1, \quad y'(0) = 0.$$

(c) $y'' + 2y' + y = 4e^{-t}$ $y(0) = 2, \quad y'(0) = -1.$