

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

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