

1. Determine the Laplace Transform of the following functions:

a) $f(t) = 5t^3 - 2t + 3 + 2\cos(2t) - 3e^{2t}$

b) $f(t) = 5\sinh(2t) + e^{2t}\cos(3t) - 5t^4 - 3$

c) $f(t) = e^{7t}\sin(4t) - 5e^{-2t}\cos(7t) + 3t^2 + 2$

d) $f(t) = \begin{cases} 2t^2 + 3; & 0 \leq t \leq 1 \\ 3; & 1 < t \leq 3 \\ e^{t-3}; & t \geq 3 \end{cases}$

2. Determine the inverse Laplace transform of the following functions:

a)
$$F(s) = \frac{s^2 + 9s + 38}{(s + 2)(s^2 + 6s + 16)}$$

b)
$$F(s) = \frac{4s^2 - 8s - 86}{(s + 2)(s + 5)(s - 4)}$$

c)
$$F(s) = \frac{4s^2 - 23s + 16}{(s-4)(s^2 - 6s + 2)}$$

d)
$$F(s) = \frac{2s^2 - 4s - 23}{(s+2)(s^2 + 8s + 19)}$$

3. Using Laplace transform to solve the following DE:

a) $y'' + 5y' + 4y = 20 \sin(2t); y(0) = 1, y'(0) = -2$

b) $y'' + 2y' - 2y = 3e^{-2t}; y(0) = 3, y'(0) = -1$

c) $y'' - y = 8e^t \sin(2t); y(0) = 2, y'(0) = -2$

d) $y'' + 2y' - 3y = 26e^{2t} \cos(t); y(0) = 1; y'(0) = 0$