

Mathematical Methods - Homework 2

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Exercise 1

- Without using the table of Laplace transforms (i.e., using the definition of the Laplace transform), find the Laplace transform:

$$\mathcal{L}\{\sin at\}$$

Exercise 2

- Find the inverse Laplace transforms:

①

$$\mathcal{L}^{-1}\left(\frac{s}{s^2 + 9}\right)$$

②

$$\mathcal{L}^{-1}\left(\frac{1}{s^2 - s - 2}\right)$$

Exercise 3

- Solve $\ddot{x} - x = 0$ with $x(0) = x_0$ and $\dot{x}(0) = u_0$

Exercise 4

- Solve $\ddot{x} + x = \sin 2t$ with $x(0) = 2$ and $\dot{x}(0) = 1$ by Laplace transform methods