Indian Institute of Technology Indore
Semester: Spring 2018
Course: Linear Algebra and Differential Equations-I (MA-106)
Tutorial-10

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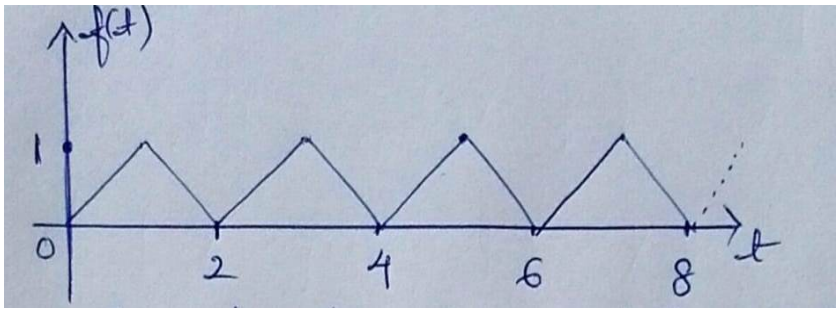
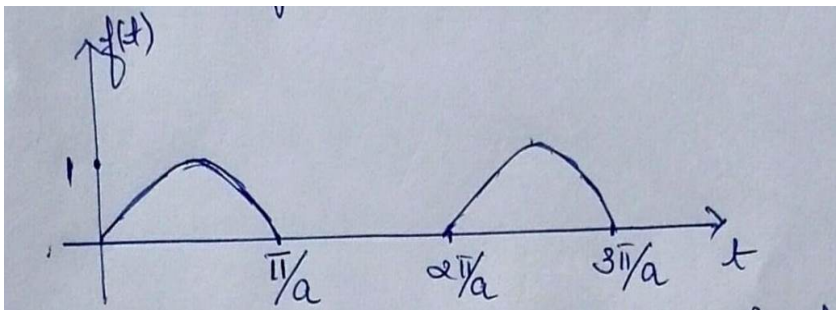
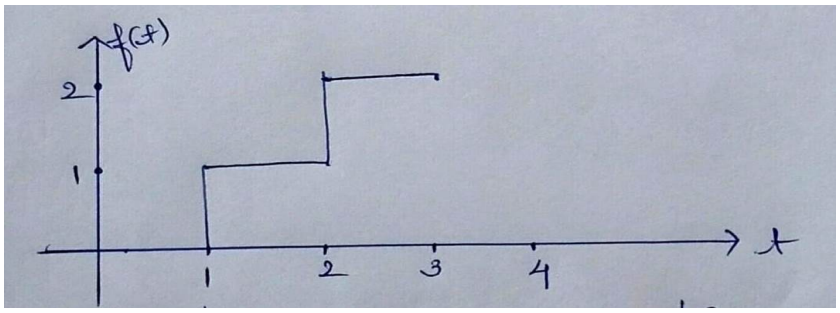
1. Find the Laplace transform of the function represented by the following graph.



2. Find the Laplace transform of the half wave rectification of $\sin at$ given by



3. Find the Laplace transformation of the staircase function given by



4. Solve the IVP

$$y'' + 9y = \begin{cases} 8\sin t & \text{if } 0 < t < \pi \\ 0 & \text{if } t > \pi \end{cases}$$

and $y(0) = 0, y'(0) = 4$.

5. Use Laplace transformation to solve

$$y' + \int_0^t y(t-x)e^{-2x}dx = 1;\ y(0) = 1.$$

6. Solve the following IVP

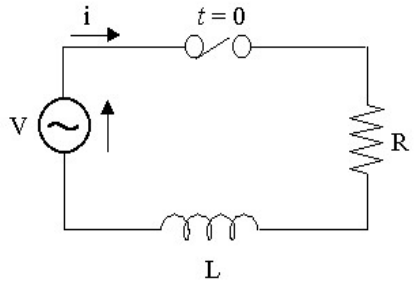
$$2y'' + 10y = 3u(t-12) - 5\delta(t-4);\ y(0) = -1, y'(0) = -2,$$

where $\delta(\cdot)$ is the Dirac's delta function.

7. Show that the Laplace transform of full-wave rectification of $\sin at$ is $\dfrac{a}{a^2+s^2}\coth\dfrac{\pi s}{2a}$.

8. Derive $\mathcal{L}\left\{\dfrac{f(t)}{t}\right\} = \int_s^\infty F(u)du$.

9. Using Laplace transforms, solve $i(t)$ for the following circuit, given that $V(t) = 10sin5t$, $R = 4W$ and $L = 2H$.



10. Figure out the Laplace transform of the solution $y(t)$ of the following second order initial value problem:

$$y'' + py' + qy = f(t), \quad y(0) = y_0, y_1(0) = y_1.$$

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