Lecture 5.4: Periodic forcing terms

Matthew Macauley

Department of Mathematical Sciences
Clemson University
http://www.math.clemson.edu/~macaule/

Math 2080, Differential Equations

The Laplace transforms of a periodic function

Goal

Suppose $f(t)$ is periodic. We want to compute $F(s) = \mathcal{L}\{f(t)\}$.

The Laplace transforms of a periodic piecewise function

Example

Compute the Laplace transform of the square wave whose fundamental window is

$$f(t) = \begin{cases} 1, & 0 \leq t < 1 \\ -1, & 1 \leq t < 2 \end{cases}.$$

Differential equations with periodic piecewise forcing terms

Example

Solve the IVP: $y'' + y = f(t)$, $y(0) = 0$, $y'(0) = 0$, where $f(t)$ is the square wave from the previous example.