Math 305 Spring 2011

Assignment 7

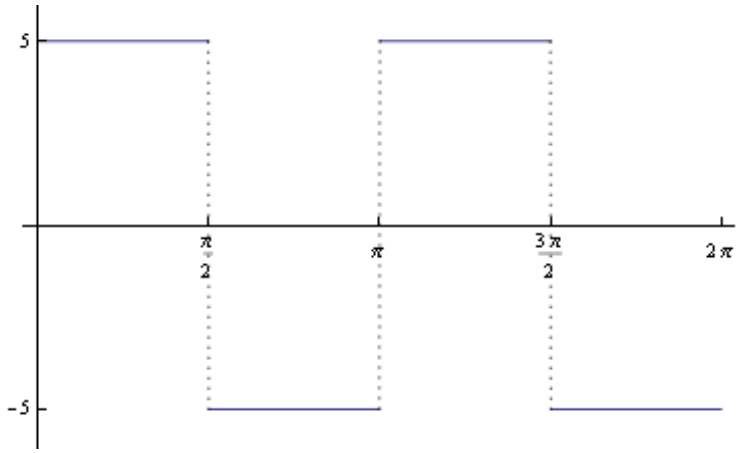
The due date for this assignment is Wednesday, April 20.

Instructions: You are encouraged to use a computer to aid with otherwise tedious computations and plotting. In these cases, provide a printout for full credit. Additionally, be sure to demonstrate your knowledge of and competence with the techniques discussed in class, for full credit.

Problem 1 *Section 5.5, #30*

Problem 2 *Section 5.5, #32*

Problem 3 *Let $f(t)$ be the following square wave with amplitude 5 and period π.*



Solve the following initial value problem and plot your solution over a reasonable domain.

$$x''(t) + 4x'(t) + 20x = f(t)$$
$$x(0) = x'(0) = 0$$

Problem 4 *Section 5.6, #2*

Problem 5 *Section 5.6, #6*

For Problems 6, 7, and 8, solve the given initial value problem and plot the solution over a reasonable domain.

Problem 6

$$y''(t) + 2y'(t) + y(t) = \delta(t-3)$$
$$y(0) = y'(0) = 1$$

Problem 7

$$y''(t) + 9y(t) = \delta(t-3\pi) + \cos(3t)$$
$$y(0) = y'(0) = 0$$

Problem 8

$$x''(t) + x(t) = \sum_{n=1}^{N} \delta(t-n\pi)$$
$$x(0) = x'(0) = 0$$

Problem 9 *Rewrite the following differential equation as a 5 dimensional system of 1st order differential equations, in matrix-vector form.*

$$x^{(5)}(t) + 3x^{(4)}(t) - x''(t) + 4x'(t) - 2x = \sin(3t)$$

Problem 10 *Consider the following two-dimensional system of second-order differential equations.*

$$\begin{aligned} x''(t) + 3x'(t) + 4x(t) - 2y(t) &= 0 \\ y''(t) + 2y'(t) - 3x(t) + y(t) &= 0 \end{aligned}$$

Rewrite the system as a 4 dimensional system of first order differential equations, in matrix-vector form.