Math 274 Homework **Name:** ____________________

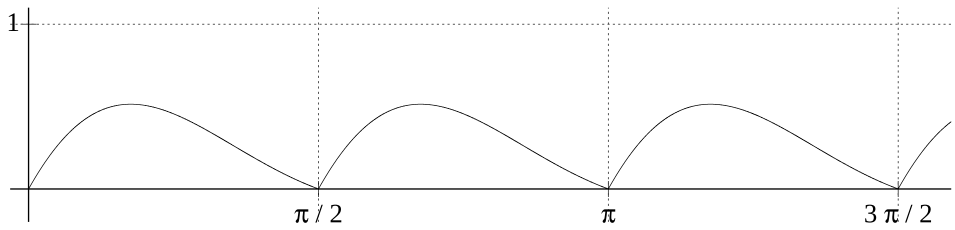
Sections: 7.9, 5.1 Point Values in $\boxed{\text{boxes}}$.

Due: 1 June 2018

1. $\boxed{2}$ Consider the initial value problem

$$x'' + 4x' + 8x = g(t), \quad x(0) = 0, x'(0) = 2.$$

Find $g(t)$ so that the solution $x(t)$ is $\pi/2$-periodic. In particular, a graph of $x(t)$ should look like the following figure.



2. $\boxed{3}$ Consider the system given by

$$\begin{aligned} x' &= x - 10y + e^{2t}, & x(0) &= 3 \\ y' &= x - 5y + \sin 2t, & y(0) &= 7. \end{aligned}$$

Convert the system into a second order initial value problem in y. **Do not solve the initial value problem.**

3. Applying the substitution

$$x = y' + y \tag{1}$$

to the symbolic system of equations

$$\begin{aligned} x' &= x - 10y + 3\delta(t-1), & x(0) &= 1 \\ y' &= x - y, & y(0) &= 1 \end{aligned}$$

converts the system into the symbolic initial value problem

$$y'' + 9y = 3\delta(t-1), \qquad y(0) = 1, y'(0) = 0. \tag{2}$$

(a) $\boxed{3}$ Solve the initial value problem (2) for $y(t)$. Express your solution as a piecewise defined function.

(b) $\boxed{2}$ Using the substitution (1), find $x(t)$ for $t \in (0, 1)$ and $t \in (1, \infty)$.