Math 331.2: Homework 9 (Section 3.8)

1. Write the following expression as a product of trigonometric functions and graph it.

$$\cos(\pi t) - \cos(3t)$$

2. For the following forced spring-mass systems determine the steady state solutions. If adequate, compute the amplitude of the steady states.

(a) $4y'' + 6y' + 2y = -3\cos(2t)$.

(b) $y'' + 0.2y' + 0.82y = 2\cos(3t) - \cos(3t)$.

(c) $4y'' + 6y' + 2y = e^{2t}$.

3. Consider the spring-mass system described by the equation

$$y'' + \frac{1}{4}y' + 2y = 2\cos(\omega t), y(0) = 0, y'(0) = 2.$$

(a) Determine the *steady state* solution.

(b) Find the amplitude A of the steady state solution in terms of ω and plot it versus ω.

5.

(a) For the equation $my'' + ky = 2\cos(3t)$ for which values of k and m do a resonnances occur?

(b) For the equation $16y'' + 9y = 3\cos(t)$ find the slow frequency and the fast frequency of the beat.

6. Solve the initial value problem $y'' + 9y = 3\cos(\pi t), y(0) = 0, y'(0) = 0$ and make a graph of the solution. *Hint: Use problem 1.*

7. Solve the initial value problem $y'' + 5y = 2\sin(2t), y(0) = 0, y'(0) = 0$.

8. Solve the initial value problem $y'' + 9y = 3\cos(3t), y(0) = 0, y'(0) = 0$ and make a graph of the solution.

9. Solve the initial value problem $y'' + 16y = 2\sin(4t), y(0) = 0, y'(0) = 0$ and make a graph of the solution.