

**Second Exam**

*Tuesday, March 22, 2016*

This exam is closed book, but you may use calculators. Make sure your name is on all pages. Show all work, and show it in a logical and organized manner. Each entire problem is worth 25 points.

1. Find the solution to the initial value problem

$$y'' + 4y' + 5y = 0, \quad y(0) = 1, \quad y'(0) = 0.$$

2. Write

$$\cos\left(\frac{1000}{2\pi}t\right) - \cos\left(\frac{1002}{2\pi}t\right) = 2\sin(A)\sin(B).$$

(That is, find  $A$  and  $B$ .)

3. Consider

$$\frac{1}{\sqrt{2}}\cos(10^6t) + \frac{1}{\sqrt{2}}\sin(10^6t) = A\cos(10^6t - \delta).$$

- (a) Find  $A$  and  $\delta$ .
- (b) What is the amplitude of the oscillation?
- (c) What is the period?
- (d) What is the phase shift?

4. Find the solution to the initial value problem

$$y'' + 4y = \sin(2t), \quad y(0) = 0, \quad y'(0) = 0.$$