Math 46, Second Exam

Tuesday, 5/30, 11:10 am – 12:30 pm.

- *This is a close book exam. The total points are 100 plus 5 bonus points.*
- *In each problem, you have to show every step of your calculation.*
- *You are only allowed to use calculator to perform basic numerical calculations.*

Name:_____

ID Number:_____

1. (20 points) Decide whether the following pairs of functions are linearly independent or not:

(1) $y_1(x) = \ln x$ and $y_2(x) = \ln x^2$;
(2) $y = \sin x$ and $y = \cos x$.

2. (20 points) Solve the following differential equation:

$$y'' + 2y' + 2y = \sin x.$$

3. (20 points) Solve the following initial value problem:

$$u'' - 2u' + u = 1$$
$$u(0) = 0,\ u'(0) = 1.$$

4. (20 points) Solving the following initial value problem:

$$y'' + 4y' + 3y = 0$$
$$y(0) = 2,\ y'(0) = 2.$$

5. (20 points) A 32 lb weight is attached to a frictionless spring, which in turn is suspended from the ceiling. The weight stretches the spring 2 ft and comes to rest in its equilibrium position. The weight is then pulled down an additional 6 inches and released with an initial upward velocity of 2 ft/sec.

(1) Find the resulting motion of the weight as a function of time.
(2) Find the amplitude, period and frequency of the resulting motion.
(3) Sketch the graph of the motion of the weight.

6. (This is a bonus problem worth 5 points.) A 16 lb weight is attached to a frictionless spring, which in turn is suspended from the ceiling. The weight stretches the spring 2 ft and comes to rest in its equilibrium position. If the weight is pull down from its equilibrium position slightly and released, after how long it will return to its equilibrium position for the first time.