Higher Math for Engineers
Review for Exam II

The second exam will cover the following topics:

I. **Substitutions and transformations.** You should be able to identify and solve homogeneous, Bernoulli and equations of the form $y' = G(ax + by)$.

Sample problems include: Problems 11,12,13 page 79.

II. **Heating and cooling of buildings.** You should know Newton's law of cooling and how to apply it to solve problems.

Sample problems include: Problems 1, 2,3,4 page 113.

III. **Homogeneous linear equations.** You should be able to find the general solution and solve initial value problems concerning homogeneous linear differential equations.

Sample problems include: 2,6,8,15,16,18 page 176.

IV. **Auxiliary equations with complex roots.** You should be able to solve a linear homogeneous differential equations whose auxiliary equation has complex roots and initial value problems.

Sample problems include: problems 21–25, page 186.

V. **Nonhomogeneous equations.** You should know the method of undetermined coefficients as stated in the table on page 193 and use it to find a particular solution to a nonhomogeneous differential equation.

Sample problems include: Problems 18-22, 25, 26 page 195

VI. **Conceptual problems.** You will be asked to answer some conceptual questions. The following are examples:

(i) What is a linear first order homoegeous equation (page 73)? What is the substitution used to solve it?

(ii) What is a Bernoulli equation? What is the substitution used to solve it?

(iii) What substitution is used to solve equations of the form $dy/dx = G(ax + by)$?

(iv) What is a second order homogeneous linear differential equation?

(v) When are two continuously differentiable functions f_1 and f_2 linearly independent?

(vi) What is the auxiliary equation associated to a second order linear homogeneous differential equation?

(vii) What is the general solution to a second order differential equation whose auxiliary equation has roots r_1, r_2 with $r_1 \neq r_2$?