Math 307 – Midterm 2 Study Topics

Midterm 2 is Friday, November 15

Section 3.1, 3.3, 3.4: Know how to find solutions to constant coefficient homogeneous equations of second order. Know the meaning of general solution, and how to find particular solutions to initial value problems.

Section 3.5: Method of undetermined coefficients. Know the general form for $Y(t)$ for the $g(t)$ considered in the Undetermined Coefficients Flowchart (Table 3.5.1 of Boyce - DiPrima, or see link below left in our class website). There may be some questions about writing down the form of $Y(t)$ with undetermined coefficients, and also problems involving finding the coefficients.

Know how to solve initial value problems for such inhomogeneous equations. Understand the superposition principle Theorems 3.5.1 and 3.5.2.

Section 3.7: Harmonic oscillation: masses on springs with or without damping. Be able to set up and solve problems, find general solutions, solve initial value problems. Be able to convert particular solutions to form $A\cos(\omega t - \phi)$. (There will not be electrical circuits on the exam.)

Section 3.8: Forced harmonic oscillations. Damped harmonic oscillators: know what steady state solution and transient solution refer to. Express steady state in form $A\cos(\omega t - \phi)$ as above. Undamped harmonic oscillators: know phenomena of beat frequencies for non-resonant driving, and how to express answers in modulated form. Know how to recognize and find solutions for resonant driving.

The following identities will be printed on the exam for your use:

$$\cos(\alpha - \beta) = \cos\alpha\,\cos\beta + \sin\alpha\,\sin\beta$$

$$\cos\alpha - \cos\beta = -2\sin\frac{\alpha+\beta}{2}\,\sin\frac{\alpha-\beta}{2}$$

$$\cos\alpha + \cos\beta = 2\cos\frac{\alpha+\beta}{2}\,\cos\frac{\alpha-\beta}{2}$$

$$\sin\alpha - \sin\beta = 2\cos\frac{\alpha+\beta}{2}\,\sin\frac{\alpha-\beta}{2}$$

$$\sin\alpha + \sin\beta = 2\sin\frac{\alpha+\beta}{2}\,\cos\frac{\alpha-\beta}{2}$$