

## MATH 0290: Spring 2012

### Exam I Review Topics

**Reading:** Chapters: 2.1-2.4, 3.1, 3.3, 3.4, 4.1, 4.3-4.7, 6.1

#### **Theory:**

- Definition and properties of an ODE
- Definition of first order ODE, normal form, initial condition
- Geometric meaning of a first order ODE
- Interval of existence
- Models of motion - derivation of the ODE, air resistance laws
- Definition of a separable ODE
- Definition of a linear ODE, homogeneous and inhomogeneous
- Definition of an integrating factor
- Models of population growth and financial models (Malthusian model, logistic model)
- Electrical circuit models, component laws, Kirchhoff's laws
- Properties of solutions of second order linear ODEs, Wronskian
- Characteristic equation for a linear second order ODE with constant coefficients

#### **Methods**

- Verifying that a function is a solution of an ODE
- Conversion of an ODE to a normal form
- Determination of solution constants using initial condition(s)
- General solution of a separable first order ODE
- Solving an initial value problem
- Solving a motion ODE model
- General solution of a linear first order ODE, homogeneous and inhomogeneous
- Solving a linear first order ODE using variation of parameters
- Solving population and financial models
- Solving homogeneous linear second order ODEs with constant coefficients
- Using method of undetermined coefficients to find a particular solution of a linear second order ODE with constant coefficients
- Using method of variation of parameters to find a particular solution of a linear second order ODE
- Finding amplitude and phase of unforced and forced harmonic oscillations with or without damping
- Euler method for numerical solution of first order ODEs