

**Topics for Exam 2****1. Solving first order differential equations**

1.1 Separation of variables

1.2 Solving the linear first order equation with constant coefficients  $\frac{dy}{dt} = ay + b$ .**2. Qualitative study of the first order differential equation:  $\frac{dy}{dt} = g(y)$ .**

2.1 Qualitative analysis of the logistic equation

2.2 Qualitative analysis of linear first-order equations

**3. Solving First Order Linear Differential Equations**

3.1 Method of Integrating Factor

3.2 Integration by parts

**4. Solving the Logistic Equation**

4.1 Existence and Uniqueness

4.2 Partial Fractions

**5. Linear Approximations**

5.1 Linear approximation to a differentiable function

5.2 Error in the linear approximation

**6. The Principle of Linearized Stability**

6.1 Stability: equilibrium points; asymptotic stability; unstable equilibrium point

6.2 Principle of Linearized Stability

**Relevant Sections in the Class Lecture Notes:** 4.6, 4.7, 4.8, 4.9, 5.1, 5.2 and 5.3**Relevant Sections in the Text:** 5.1, 5.6, 6.1, 6.2,**Relevant Assignments:** 10, 11, 12, 13, 14, 15, 16, 17 and 18.**Important Concepts:** Differential equation, initial value problem, separation of variables, integration by parts, partial fractions, linear approximation, linearized equation, equilibrium point, stability.**Important Skills:** Know how to use separation of variables to solve first order differential equations; know how to obtain qualitative information about solutions to first order differential equations; know how to integrate by parts; know how to use partial fractions; know how to solve first linear differential equations; know how to use linear approximations to differentiable functions; know how to estimate the error in the linear approximation; know how to apply the principle of linearized stability.