Topics for Exam 1, MATH308-Fall 2015

1. Direction field, autonomous equations, equilibrium points, analysis of behavior of solutions of autonomous differential equations when $t \to +\infty$ or $t \to -\infty$ on the base of the direction fields (equations of type considered in section 1.1 and section 2.5);

2. Separable equations (section 2.2)

3. Linear nonhomogeneous equations of first order: method of integrating factor (section 2.1);

4. Modeling with first order differential equation (falling of a hailstone in the presence of an air resistance (section 1.2), mixing of a substance in a tank or in a pond (section 2.3));

5. To know to determine an interval in which a solution of a linear nonhomogeneous differential equation of first order is certain to exist without solving the equation (section 2.4);

6. Exact equations and integrating factors (section 2.6);

7. Fundamental set of solutions of linear homogeneous equations of second order; the Wronskian (section 3.2);

8. Linear homogeneous equations of second order with constant coefficient in all possible cases (two distinct real roots, complex roots, repeated root) (sections 3.1, 3.3, and 3.4);

9. Spring-mass systems: undamped free vibration (including finding of the amplitude, the natural frequency, the period and the phase).

10. Spring-mass systems: damped free vibration, including finding of quasi-period, and understanding the meaning of critical damping constant.

    The last two items correspond to section 3.7. You also have to be able in both cases to sketch the graph of the solutions based on the method of parent functions.

It is recommended to review all problems in homework assignments 1-7; the examples given during the class on the topics listed above. Also it is preferable to review the problems and their solutions of the the homework assignments 1-6 and problem 2 of assignment 8 from the Spring 15 term posted on http://www.math.tamu.edu/ zelenko/S15308Hmwk.html and homework assignments 1-6, problem 1 of homework assignment 7, problem 1 of homework assignment 10 of Fall 13 term posted on http://www.math.tamu.edu/ zelenko/F13308Hmwk.html