REVIEW QUESTIONS (NOT PROBLEMS) FOR THE FIRST MIDTERM IN CALC4

Note: You don't have to answer these question verbally. Just make sure you know the answers in your mind and make sure you are capable on solving example problems from the book.

(1) What is a direction field for an ODE? How to draw it? What is an integral curve? How to sketch it? What is the relationship among ODE, solutions of ODE, direction field and integral curves? (Section 1.1)

(2) What is an initial value problem? What is the difference between a solution of an IVP to the general solution of ODE? (Section 1.2)

(3) How to find the order of an ODE? How to determine whether an ODE is linear or nonlinear? (Section 1.3)

(4) What is the standard form of a first-order ODE? How to find its integrating factor? How to check if you have the correct integrating factor? How to use the integrating factor to solve the first-order linear ODE? How to check if you have the correct solution? (Section 2.1)

(5) What does it mean for an ODE to be separable? How to solve it? (Section 2.2)

(6) How to use differential equation to model a real world problem? (Section 2.3)

(7) When does a first-order ODE have a unique solution? What are the conditions? How to find the the regions where the solution exists uniquely? Also answer these questions for a second-order linear homogeneous ODE. (Section 2.4, 3.2)

(8) What is an autonomous ODE? What is its equilibrium solution? What does it mean for an equilibrium solution to be stable from above, stable from below, unstable from above, unstable from below? And what does it mean for an equilibrium solution to be stable, semistable and unstable? (Section 2.5)

(9) What is an exact ODE? How to solve an exact ODE? What can you do when you find your ODE not exact? (Section 2.6)

(10) What is a characteristic equation? What can its root be? How to use that to solve a second-order linear homogeneous ODE whose coefficients are constant? (Section 3.1 - 3.4)

(11) What does it mean for two functions to be independent? Show an example where two functions are not independent. What is a fundamental set of solutions for a second-order linear homogeneous ODE? (Section 3.2)

(12) What is the principle of superposition? What can you conclude if you have a fundamental set of solutions for a second-order linear homogeneous ODE? (Section 3.2)