

**Exam 3 Review Sheet**

This exam covers sections 11.1, 11.2, 11.3 and Sections 2.1 and 2.2 of the packet, "Topics from Differential and Difference Equations," by Melvin D. Lax.

**Vocabulary**

You may be asked what form is taken by differential equations of the following types.

- Separable differential equation (page 606).
- Unlimited growth model (page 608), including what the constant  $k$  stands for, and what the variables  $x$  and  $y$  represent.
- Limited growth model (page 609), including what the constants  $k$  and  $N$  stand for, and what the variables  $x$  and  $y$  represent.
- Logistic growth model (page 609), including what the constants  $k$  and  $N$  stand for, and what the variables  $x$  and  $y$  represent.
- Linear first-order differential equation (page 616).
- The order of a difference equation (packet, page 8).

You will not be asked to state the following, but you should be able to use them to solve problems and answer questions.

- General solution to a differential equation (these solutions include the constant  $C$  that arises from integration, so they represent all solutions to the differential equation) (page 604).
- Particular solution to a differential equation (in these solutions, you find the constant that arises from integration using additional given information; all of the WeBWork problems asked for particular solutions) (page 605).
- Integration factor (page 618).
- Equation and slope of the tangent line to a graph (page 183).
- Sequence, term and position number.
- Recursive formula for a sequence, which is the same as a difference equation (packet, page 8).
- First order linear difference equation and its solution (packet, Theorem 2.1, page 10).

The following list describes the content of the exam.

**Section 11.1**

You *will* be asked to

- Find the general solution to a separable differential equation.
- Find a particular solution to a separable differential equation.

**Section 11.2**

You *will* be asked to

- Find the general solution to a linear first order differential equation.
- Find a particular solution to a linear first order differential equation.

The problems from 11.1 and 11.2 involve integration. You *may* be asked to solve integrals using the following techniques and formulas, probably as part of finding the solution to a differential equation.

- Power rule for integration (page 371).
- Integral of  $x^{-1}$  (page 374).
- Integral of  $e^x$  (page 375).
- Substitution, in particular to solve integrals similar to the following.

$$\int xe^{x^2} dx \text{ or } \int \frac{t}{t+1} dx$$

Note that both of these came up in WeBWork problems. Substitution is covered in Section 7.2

### Section 11.3

Given a differential equation and an initial condition (like  $y(0)=3$ , or some such), you *will* be asked to

- Find the slope of the tangent line to the solution of the differential equation at the given point.
- Find the equation of the tangent line to the solution of a differential equation at the given point.
- Approximate the value of the solution to the differential equation at a point near the given point, using the tangent line.

Packet, Section 2.1: Sequences. You *will* be asked to

- Given a sequence of numbers, produce a formula for that sequence, using subscript notation.
- Given a formula for a sequence in subscript notation, you may be asked to list some terms of the sequence.
- Determine whether or not a given formula for a sequence is recursive.

Packet, Section 2.2: First order linear difference equations. You will be given the formula for the first order linear difference equation, as well as Table 2.1 from the packet. You *will* be asked to

- Calculate the sum of a series by writing out the terms in the series and adding them.
- Verify that a sequence satisfies a difference equation.
- Solve first order linear difference equations and express your answer without using summation notation.