LECTURE NOTES ON

ORDINARY DIFFERENTIAL EQUATIONS

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PREFACE

These are rough notes based on lectures given at Rutgers University in 1988, 1989, and 1995. The book *Differential Equations: Introduction and Qualitative Theory,* by Jane Cronin, was used as a text for the first two of these years, and this influenced the order of topics here, but the treatment of most topics is quite different.

I give below a list of sources consulted during the preparation of the notes. Comments are included which may guide the student in her reading.

I would appreciate being informed of any errors, minor or substantial.

Eugene R. Speer

REFERENCES

[1] Arnold, V. I., *Ordinary Differential Equations.* Trans. Richard A. Silverman. Cambridge, Massachusetts: MIT Press, 1973.

A book with a very geometric approach. The emphasis is on linear and autonomous systems.

[2] Birkhoff, Garrett, and Gian-Carlo Rota, *Ordinary Differential Equations.* 3rd ed. New York: John Wiley and Sons, 1978.

Covers material from a standard American undergraduate o.d.e. course but also more advanced material overlapping these notes.

[3] Boyce, William E., and DiPrima, Richard C., *Elementary Differential Equations.* 4th ed. New York: John Wiley and Sons, 1986.

A excellent undergraduate text, mostly on methods of explicit solution. Possibly valuable for background reading. Any edition would do.

[4] Coddington, Earl A., and Norman Levinson, *Theory of Ordinary Differential Equations.* New York: McGraw-Hill, 1955; rpt. Malabar, Florida: Robert E. Krieger Publishing Company, 1987.

A very comprehensive text; more "classical" in spirit than some others here. This and [7] are probably the best books for extensive reference.

[5] Cronin, Jane, *Differential Equations: Introduction and Qualitative Theory.* New York: Marcel Dekker, Inc., 1980.

A nice book with topics very similar to those covered here.

[6] Hale, Jack K., *Ordinary Differential Equations.* New York: John Wiley and Sons, 1969; rpt. Malabar, Florida: Robert E. Krieger Publishing Company, 1980.

Mathematically sophisticated presentation; modern material.

[7] Hartman, Philip, *Ordinary Differential Equations.* 2nd ed. New York, John Wiley and Sons, 1973; rpt. Boston, Birkhäuser, 1982.

Very, very comprehensive; lots of good material. This and [4] are probably the best books for extensive reference.

[8] Hirsch, Morris W. and Stephen Smale, *Differential Equations, Dynamical Systems, and Linear Algebra.* Orlando, Florida: Academic Press, 1974.

Emphasis similar to that of [1]; lots of material on linear systems. Includes applications.

[9] Lefschetz, Solomon, *Differential Equations: Geometric Theory.* 2nd ed. Interscience, 1963; rpt. New York: Dover Publications, 1977.

This book has most of our topics; its style is a little old fashioned.

[10] Petrovski, I.G., *Ordinary Differentail Equations.* Trans. and ed. Richard A. Silverman. Prentice Hall, 1966; rpt. Dover Publications, 1973.

A nice, short book. It is quite cheap and would be convenient for supplementary reading.