Calculus 3, Chapter 11 Study Guide

Prepared by Dr. Robert Gardner

The following is a *brief* list of topics covered in Chapter 11 of *Thomas' Calculus*. Test questions will be chosen directly from the text. This list is not meant to be comprehensive, but only gives a list of several important topics. I reserve the right to ask you definitions and theorems on the tests. If I do so, then I will choose from the **bold-faced** items below.

11.1 Parametrizations of Plane Curves. Parametric curves, parameter, initial and terminal points, cycloid, brachistochrone problem, tautochrone problem.

11.2 Calculus with Parametric Curves. Differentiable parametric curves and computation of derivatives, smooth curves and arclength, area, surface area of revolution.

11.3 Polar Coordinates. Polar coordinates, initial ray, r as directed distance, multiple representations of given points, conversion between polar and rectangular coordinates.

11.4 Graphing in Polar Coordinates. Symmetry Tests for Polar Graphs of $r = f(\theta)$, dy/dx in polar coordinates, limaçons, cardioids.

111.5 Areas and Lengths in Polar Coordinates. Areas in polar coordinates, arc lengths in polar coordinates.

11.6 Conic Sections. **Parabola** (focus, directrix, axis, focal length, standard form), **ellipse** (foci, focal axis, vertices, major axis, minor axis, semimajor axis, semiminor axis, standard form), **hyperbola** (foci, focal axis, vertices, asymptotes, standard form), optical properties of conics, graphing.

11.7 Conics in Polar Coordinates. Eccentricity of conics, directrices of ellipses and hyperbolas, the focus-directrix equation, conics in polar coordinates, lines in polar coordinates, circles in polar coordinates.