Learning Outcomes for Calculus II (MATH 123)

Upon completion of the course, the student will be able to:

1. interpret a volume of revolution of a function’s graph around a given axis as a (Riemann) sum of disks or cylindrical shells, convert to definite integral form and compute its value.

2. express the length of a curve as a (Riemann) sum of linear segments, convert to definite integral form and compute its value.

3. express the surface area of revolution of a function’s graph around a given axis as a (Riemann) sum of rings, convert to definite integral form and compute its value.

4. antidifferentiate products of functions by parts.

5. recognize and implement appropriate techniques to anti-differentiate products of trigonometric functions.

6. devise and apply a trigonometric substitution in integrals involving Pythagorean quotients

7. decompose a rational integrand using partial fractions

8. determine convergence of improper integrals with discontinuities in their domain or infinite limits of integration

9. identify and solve differential equations of the following types: first-order separable; first-order linear; second-order linear homogeneous with constant coefficients

10. use initial conditions to set up and solve differential equations of the above types to model various phenomena in the physical, biological, and social sciences, including compound interest, radioactive decay, cooling, and exponential and logistic population growth

11. use the concept of the limit at infinity to determine whether a sequence of real numbers is bounded and whether it converges or diverges

12. interpret the concept of a series as the sum of a sequence, and use the sequence of partial sums to determine convergence of a series.

13. decide whether and to what value an infinite geometric series converge

14. use comparison with a corresponding integral with other series to decide whether infinite series (including p-series) converge or diverge
15. be able to decide whether an alternating series converges from the limit and monotonic decrease of the sequence of absolute values of its terms

16. distinguish between absolute and conditional convergence of series and be aware of the consequences of reordering terms in conditionally converging series

17. perform the ratio and root test to determine convergence of infinite series

18. interpret a converging power series as a function

19. determine the Taylor series of the nth order and determine an upper bound on its remainder.

20. manipulate Taylor series by substitution and (anti-) differentiation to obtain expansions for other functions.

21. devise parametric representations for conic sections and other relations

22. compute the length of a curve segment from its parametric representation.

23. apply basic antidifferentiation techniques to selected problems arising in various fields such as physical modeling, economics and population dynamics.