

## 1 Warning

Community College of Philadelphia is a firm adherent to the principle of academic freedom. In light of this, faculty are not required to follow a particular approach or a particular textbook for the courses they teach. Most faculty, however, have more or less uniform guidelines for specific courses, and indeed, many use a particular textbook or approach in order to conform to area institutions. Therefore, the sample syllabus found here is not binding to faculty, but represents a synthesis of what most faculty do or aspire to do when they teach a particular course. What follows should not be interpreted as a prescription, but rather, as a means to help the placement of our students in transfer institutions.

## 2 Catalogue Description

Topics to be covered: review of antiderivatives, definite integral and the substitution rule; applications of the definite integral, techniques of integration, improper integrals, applications of improper integrals; polar coordinates and parametric equations, conic sections; finite sums, summation formulas, induction, infinite series, geometric progression, power series, convergence tests, alternating series; Taylor and Maclaurin series. Prerequisite: MATH 166 or MATH 171.

## 3 Allotted Time

Math 172 is a four credit course. Thus it meets for  $4 \times 14 = 56$  hours in a semester, including two hours for a final examination. Instructors usually give three or four exams (generally lasting at least 55 minutes), and a 2-hour long final exam.

## 4 Topics Outline

- Antiderivatives.

- The Definite Integral.
- Integration by Substitution.
- Areas and Volumes.
- Volumes by Shells and Washers.
- Work. Average Value of A Function.
- Inverse Functions. Exponential Functions.
- Logarithmic Functions.
- Inverse Trigonometric Functions. Hyperbolic Functions.
- L'Hôpital's Rule
- Integration by Parts. Trigonometric Integrals.
- Trigonometric Substitution. Partial Fractions.
- Improper Integrals.
- Arc Length. Surface Area.
- Sequences. Series.
- Integral Tests and Estimates of Sums.
- De Morgan's Logarithmic Scale. Comparison Tests.
- Alternating Series. Absolute and Conditional Convergence.
- Power Series.
- Taylor and MacLaurin Expansions. Binomial Series.
- Applications of Taylor Polynomials.

## 5 Competencies

1. The Student will demonstrate knowledge of integrating functions by:
  - (a) using integration by parts,
  - (b) computing trigonometric integrals,
  - (c) using appropriate trigonometric substitutions,
  - (d) using partial fractions,
  - (e) using rationalizing substitutions.
  - (f) using Weierstrass' double angle substitution
2. The Student will demonstrate knowledge of improper integrals and their convergence by:
  - (a) computing convergent improper integrals of type-1 and type-2,
  - (b) identifying improper integrals that are divergent,
  - (c) using comparison theorems to test their convergence.
3. The Student will demonstrate knowledge of applications of integrals by:
  - (a) finding the arc length,
  - (b) finding the area of surface of revolution,
4. The Student will demonstrate knowledge of sequences and series by:
  - (a) finding limits using L'Hopital's Rule,
  - (b) determining the convergence or divergence of a sequence with different techniques,
  - (c) computing the limits of convergent sequences,
  - (d) recognizing types of series, such as, geometric, telescopic, harmonic, alternating,  $p$ -series, power series etc.,
  - (e) determining convergence or divergence of a series by comparison test, limit-comparison test, integral test, alternating series test,  $p$ -series test,
  - (f) determining the absolute convergence or conditional convergence by ratio test and/or root test,
  - (g) determining the radius of convergence and the interval of convergence of a power series,
  - (h) finding the Taylor and Maclaurin series of an analytic function ,
  - (i) finding binomial series.