Calculus I Guide

Based on the 2012 assessment, some students may need additional work on the following topics:

I. **Integration by Substitution**
   Students were not able to integrate a function using substitution by hand or by using technology. Instructors should place greater emphasis on the following:
   - Identifying \( u \) and \( du \) and using them in the integral;
   - Identifying the anti-derivative function;
   - Knowing what to do with integral limits;
   - Using the FTC to evaluate definite integrals;
   - Verifying answers using technology.

II. **Graph Analysis**
   Students were successful in identifying discontinuities and cusps of a graph. However, they did not make the connection between the sign of the derivative and the behavior of the function.
   Students also did not make the connection between continuity and limit at a point.
   Instructors should place greater emphasis on the following:
   - Graphing piecewise functions;
   - Using graphs of different piecewise functions to establish the connection between continuity and limits, and the connection between the sign of the derivative and the behavior of the function.

III. **Optimization**
   Students were not successful in optimizing an economics problem. Instructors should place greater emphasis on the following:
   - Identifying the problem’s differential equation;
   - Solving different types of algebraic and trigonometric equations;
   - Testing extreme points;
   - Solving a variety of optimization problems, such as those dealing with geometry, economics, and number optimization.
IV. **Parametric Equations**
Students could not identify the equation of a line tangent to a parametric curve. This topic is on the Calculus I expected educational results. Instructors should place greater emphasis on:

- Finding the slope of the line tangent to a curve presented in parametric equations;
- Finding the point of tangency.

V. **Concavity and Inflection Points**
A little over half of students were able to identify when a polynomial is concave downward. Instructors should place greater emphasis on:

- Finding a curve's possible points of inflection;
- Correctly using these points to describe graph concavity.