

# Calculus 1 Refresher Course Syllabus

## Dates of Course

## Course Description

This course will explore topics typically covered in the Calculus 1 course. The goal is to help the participant refresh and prepare a course for his or her high school classroom. The course will refresh content knowledge and examine strategies and skills to engage secondary level mathematics students as they begin to master Calculus 1.

## Instructor

Marjorie (Marge) Johnson - Four years ago I was given the assignment to teach Calculus to our accelerated high school seniors. I searched high and low for an inexpensive and timely refresher before I took on my own students! I found nothing available that met my criteria so I jumped in and somehow managed to stay above water and prepared (on my own) my plans to teach the course! Thus the reason I am choosing to offer this to you. I have taught for 15 years but my Calculus had become a bit rusty after being out of college for awhile. Hopefully this course will give you the knowledge and confidence to walk into your Calc classes with ease and excitement!

Credentials and Educational History:

BS SUNY Oneonta

MS SUNY Stony Brook

7-12 Mathematics NYS Certification

## Course Goals and Objectives

Participants will be able to

1. evaluate limits using properties of limits.
2. determine the equation of the tangent and normal line to a curve at a point.
3. determine the derivative of a function in general and at a point.
4. determine the instantaneous rate of change and average rate of change.
5. calculate average velocity, instantaneous velocity, speed, and acceleration given a position function.
6. calculate marginal cost and marginal revenue given cost and revenue functions.
7. determine the derivative of trigonometric functions.
8. calculate the slope of a curve using implicit differentiation.
9. calculate the extrema of a function using critical points.
10. calculate a general antiderivative of a given function.
11. calculate the displacement and velocity given an acceleration function.
12. determine the concavity using the second derivative and identify points of inflection of a function.
13. describe a particle's motion using first and second derivatives.
14. maximize or minimize in real life problems given quantities by locating extrema.
15. calculate the linearization of a function at a point and approximate the value using linearizations.

16. estimate areas with finite sums.
17. calculate the distance traveled by computing the area under a velocity function.
18. estimate the area under a graph of a nonnegative function using a rectangular approximation method.
19. calculate the total area between a function and the x-axis.
20. solve exact differential equations and initial value problems.
21. apply Euler's method to find approximate solutions to initial value problems.
22. calculate indefinite and definite integrals.

### **AP & AB Calculus Mathematics Standards Addressed:**

#### **STANDARD 2: LIMITS AND DIFFERENTIAL CALCULUS**

**Participants demonstrate their knowledge of the limits, continuity, the derivative and problem solving using derivative concepts.**

- 2.1 Demonstrate the understanding of limit properties, e.g., limit of a constant, sum, product and quotient.
- 2.2 Find the high order derivatives, relation between differentiability and continuity.
- 2.5 Demonstrate an understanding and application of the formal definition of derivative of a function at a point and the notion of differentiability.
- 2.7 Use Newton's method to approximate the zeros of a function.
- 2.8 Find the derivatives of elementary functions, of sum, product, quotient, of composite function (chain rule) and of an implicitly defined function.
- 2.10 Use limits to find horizontal, vertical and slant asymptotes. Use derivatives to find the increasing and decreasing intervals, the critical points and relative extrema, the concavity and inflection points of a function. Utilize the above findings to sketch the graph of the function.
- 2.11 Evaluate the average and instantaneous rates of change and find the velocity and acceleration of a particle moving along a line.
- 2.12 Solve problems involving rates and change.

#### **STANDARD 3: INTEGRAL CALCULUS**

**Participants demonstrate their knowledge of anti-derivative techniques and problem solving in integral calculus.**

- 3.1 Use techniques of integration including basic integration formulas, integration by substitution, change of variables, and simple integration by parts.
- 3.2 Use integration techniques to find distance and velocity from acceleration with initial conditions and problem solving in growth and decay.
- 3.3 Apply the definite integral concepts such as area, approximations to the definite integral by using rectangles and the limit as a sum.
- 3.4 Use the fundamental theorems of Calculus.
- 3.6 Use Riemann and Trapezoidal sums to approximate definite integrals of functions represented algebraically, geometrically and by tables of values.

### **Contact Information:**

Marge Johnson - Math Department Chairperson/Teacher

[margemath@rocketmail.com](mailto:margemath@rocketmail.com)

607-435-2392

### **Prerequisite Skills/Requirements**

Participants must know how to use Microsoft Word (Mac or Windows)-creating, attaching, and downloading documents.

Participants must know how to access the internet and email.

Participants will need

Internet and email access

Microsoft Office 2003 or higher application

Windows Media Player (free download)

Flash (free download)

Java (free download)

Adobe Reader

Graphing Calculator

### **Recommendation for Inservice Credit:**

1. Inservice credit will be recommended if the participant

- a. Logs on a minimum of 3 days per week
- b. Participates weekly on all assignments-lack of participation or inappropriate participation can result in loss of credit.
- c. 75% (C-complete) or above is achieved on all assignments

