Lesson 1

Maximum and Minimum Number Problems

Objectives: Solve maximum and minimum problems using derivatives

- **Warm Up:** How do we find the maximum and/or minimum values of any curve.
- **Investigate:** Different pairs of numbers may have the same sum but they will have different products. Among these products it is possible to find a maximum value. Trial and error could be used to identify these values, but that procedure would become time-consuming as the given sum increases. The following examples shows a way that calculus solves this and similar problems.
- 1. Find two positive numbers whose sum is 15 and whose product is a maximum.
- 2. Find two numbers whose difference is 100 and whose product is a minimum.
- 3. Find two positive numbers whose product is 108 and the sum of the first number plus three times the second number is a minimum.
- 4. Find to positive numbers whose sum is 30 and the square of one number plus twice the square of the other is
 - a) a minimum
 - b) a maximum

Homework:

- **1.** The sum of two natural numbers is 28. Find these two numbers if their product is a maximum.
- **2.** Find two consecutive natural numbers if the sum of the larger number and four times the reciprocal of the smaller number is a minimum.
- **3.** The sum of two positive numbers is 4. If the sum of their cubes is a minimum, what are these numbers?
- **4.** Find two numbers that satisfy the conditions that the sum of the first number and twice the second number is 100, and the product is a maximum.

Solutions:

- 1. The two natural numbers are 14 and 14.
- 2. The two numbers are 2 and 2 + 1 = 3.
- 3. The two numbers are 2 and 2.
- 4. The two numbers are 50 and 25.