

Topic #17 (Math 31)

1. Goals (Sections 4.7)
 - a. Optimization
2. Motivating example:
 - a. Consider all rectangles with area 100.
 - i. Which minimizes the perimeter?
 - ii. A square for any area?
 - b. Consider all rectangles with perimeter 100
 - i. Which maximizes the area?
 - ii. A square for any perimeter?
3. Preparation for optimization:
 - a. Question: Find the maximum or minimum value of $f(x)$ restricted to specified x values.
 - b. Approach: Find the absolute max or min on the relevant interval (earlier topic)
 - c. Examples to recall:
 - i. Find max value of $f(x) = -3x^2 + x$
 1. On $(-\infty, +\infty)$
 2. For positive x
 3. On interval $[1, 9]$
 - ii. Find min value of $g(x) = x^3 - 3x + 1$
 1. For positive x
 2. On interval $[0, 1]$.
 - iii. Find max value of $g(x) = x^3 - 3x + 1$
 1. On $[0, 3]$
 2. On $[0, 4]$
 3. For positive x
4. Optimization Problems
 - a. Initial Example: Sum is 9 and product max.
 - i. Do by tables
 - ii. Do by calculus
 - b. Strategy:
 - i. Name the quantities in the problem using variables
 - ii. Write down the constraining equation
 - iii. Determine the expression to be minimized or maximized
 - iv. (make it a function of one variable using the constraint)
 - v. Apply calculus to determine the max or min.
5. Examples:
 - a. Do starting question above.
 - b. Section 4.7: 337 – 340 (of given expressions)
 - c. Section 4.7: 316 – 322, 326 – 336,
 - d. Section 4.7: 341 – 346