Math 156 Applied Honors Calculus II Fall 2009

hw#2 , due: Tuesday, September 22

appendix E (sigma notation) page A38 / 40

section 5.2 (definite integral) page 337 / 27 (use Riemann sums, not the FTC) , 53 , 68

hint for 53 : draw a picture

section 5.3 (FTC) page 348 / 14 , 30 , 54

section 5.4 (antiderivatives) page 358 / 57

chapter 5 (review) page 369 / 7

1. (a) Derive the following formula for the sum of a finite geometric series,

$$\sum_{i=0}^{n} r^i = 1 + r + r^2 + \cdots + r^n = \frac{r^{n+1} - 1}{r - 1} \quad , \quad \text{if } r \neq 1.$$

hint: to get some insight, check the formula in some special cases, e.g. $n = 0, 1, 2, 3$

(b) Use this formula to evaluate $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots + \frac{1}{1024}$.

(c) What happens to the formula in (a) if $r = 1$?

2. Evaluate each integral by two methods: (1) limit of Riemann sums, (2) FTC.

a) $\int_0^1 x^3\,dx$ b) $\int_0^1 e^x\,dx$

3. Consider the integral $I = \int_0^1 e^{-x}dx = 1 - e^{-1} = 0.63212056$.

a) Find an upper bound for the integral $\int_0^1 e^{-x}dx$ (as we did in class for $\int_0^1 e^x dx$).

b) Let R_n be the righthand Riemann sum and let M_n be the midpoint rule, with n intervals. Construct a table with the following data (use a calculator). column 1: n (take $n = 1, 2, 4$); column 2: Δx; column 3: R_n; column 4: $|I - R_n|$; column 5: M_n; column 6: $|I - M_n|$. For a given value of n, which method gives a more accurate answer, R_n or M_n? When Δx decreases by 1/2, by what factor does the error decrease for each method?

4. Prove: $\int_a^b (f(x) + g(x))\,dx = \int_a^b f(x)\,dx + \int_a^b g(x)\,dx$

Announcement

The Science Learning Center offers study groups for Math 156 students. The groups meet weekly to review course material, solve problems, and gain a better understanding of course concepts. Each group has 8-12 members and is led by a former 156 student trained by the SLC. Group membership is voluntary, but requires active participation and regular attendance. For more information check the SLC website www.lsa.umich.edu/slc. Online registration for Math 156 begins on Tuesday Sept 15 at 9am. Study groups will begin meeting on Sunday Sept 20.