Math 131: Day 4

My Office Hours: M & W 12:30–2:00, Tu 2:30–4:00, & F 1:15-2:30 or by appointment. **Math Intern** Sun: 12–6pm; M 3-10pm; Tu 2–6, 7–1pm; W and Th: 5-10 pm in Lansing 310. Website: `http://math.hws.edu/~mitchell/Math131S13/index.html`.

Practice

1. Read Section 5.2 which finishes our introduction to the Riemann Integral.
  - **a)** Understand the definition of a **Riemann Sum** (p. 323).
  - **b)** Memorize the definition of a **Definite Integral** (p. 324).
  - **c)** Understand Theorem 5.2 (p. 325).
  - **d)** Remember, geometrically, a definite integral $\int_a^b f(x)\,dx$ is the net area 'under' f on $[a, b]$. We have 'solved' the area problem.
  - **e)** Next time we will discuss the properties of the integral in the last few pages of the section. So with that in mind: Review the properties of Definite Integrals on pages 327–329. These are summarized on page 329.

2. Review section 5.2 as needed trying page 331 #1, 3, 5, 9 (what shape is the area under the curve), 11 (left and right only), 19, 21, 23, and 25.

Extra Credit

1. We only have a few summation formulas. But there are lots of functions. Use the `xFunctions` software utility that is online (there is a red link to it and instructions on the course homepage listed above) to estimate the following by using Lower(500) and Upper(500), inscribed and circumscribed rectangle sums. To receive credit, print out the first page of the results showing the graph.

a) $\displaystyle\int_0^2 e^{\sin x}\,dx$ **b)** $\displaystyle\int_1^3 \ln(x) + \cos(x)\,dx$

Note: $e^{\sin x}$ is entered as `exp(sin(x))`.

Math 131: Homework Due:

1. Complete the blue half-sheet and bring it to LAB tomorrow.

2.
  - **a)** WeBWorK assignment Day03 Due Friday night.
  - **b)** WeBWorK Lab02Review that I will be available Thursday morning. This will consist of three problems that review material on the lab. Due Saturday

3. Hand in the Yellow Sheet From Day 3 on Friday.

4.
  - **a)** Optional: Try the Extra Credit above.
  - **b)** Not to hand in: Before Lab, try the Self-Reivew problems that follow on this sheet. Ask questions about them in Lab.

Self-Review From Class

1. Definition: Suppose f is defined on the interval $[a, b]$ with partition $a = x_0 < x_1 < x_2 < \cdots < x_{n-1} < x_n = b$. Let $\Delta x_i = x_i - x_{i-1}$ and let c_i be any point chosen so that $x_{i-1} \le c_i \le x_i$. Then

$$\sum_{i=1}^{n} f(c_i)\Delta x_i$$

is called a **Riemann sum** for f on $[a, b]$.

2. We will often use **regular partitions** where

$$\Delta x = \frac{b-a}{n} \qquad \text{and} \qquad x_i = \_\_\_\_\_\_\_\_\_\_.$$

Generally we will look at **upper sums** and **lower sums**

$$\text{Upper}(n) = \sum_{i=1}^{n} f(M_i)\Delta x$$

where $f(M_i)$ is the maximum value of f on the ith subinterval and

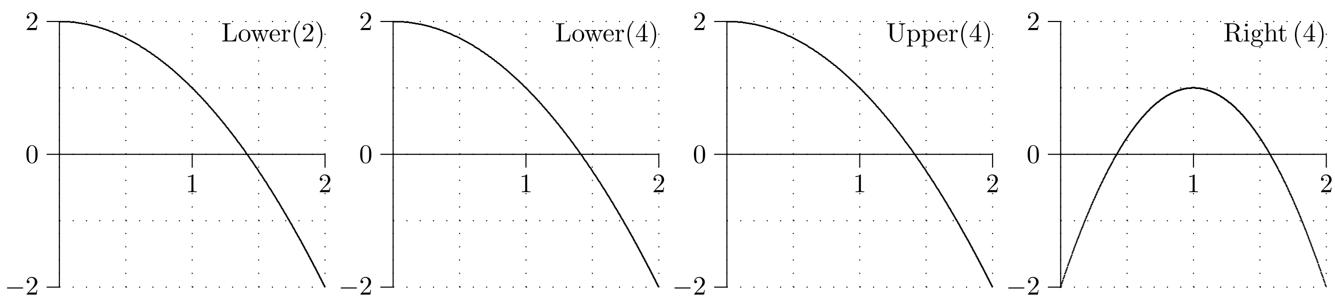
$$\text{Lower}(n) = \sum_{i=1}^{n} \_\_\_\_\_\_\_\_\_\_ \Delta x$$

where ____________________________________ of f on the ith subinterval.

3. Whenever possible we will use **right-hand Riemann sums** where the right-hand endpoint x_i of each interval is the evaluation point. This makes the calculations easy.

$$\text{Right}(n) = \sum_{i=1}^{n} f(x_i)\Delta x.$$

4. Draw the following:



Practice

1. a) Fill in the following table for the Riemann sums using regular partitions and right-hand endpoints.

$f(x)$	$[a,b]$	Δx	$x_i = a + i\Delta x$	$f(x_i)$	$\text{Right}(n) = \sum_{i=1}^{n} f(x_i)\Delta x$ (Do not simplify yet)
$x^2 - 1$	$[0,2]$				
$2(x-1)^2$	$[1,4]$				
$\sin(x)$	$[0,\pi]$				

b) For $2(x-1)^2$, simplify $\text{Right}(n) = \sum_{i=1}^{n} f(x_i)\Delta x$.

c) Then calculate $\int_1^4 2(x-1)^2\,dx$ by evaluating $\lim_{n\to\infty} \text{Right}(n)$.

Math 131: Pre-Lab 2. Complete and Bring to Lab. Name: ______________________

1. a) Fill in the following table for the Riemann sum using regular partitions and right-hand endpoints.

$f(x)$	$[a,b]$	Δx	$x_i = a + i\Delta x$	$f(x_i)$	Wirte out Right$(n) = \sum_{i=1}^{n} f(x_i)\Delta x$ (Do not simplify yet)
$(x+1)^2$	$[0,3]$				

b) Simplify Right$(n) = \sum_{i=1}^{n} f(x_i)\Delta x$. No sum should appear. (Use back, if needed.)

c) Evaluate $\lim_{n\to\infty}$ Right(n). When $f(x)$ is continuous, this limit is denoted by $\int_a^b f(x)\,dx$. Here we would write $\int_0^3 (x+1)^2\,dx$.

Math 131: Pre-Lab 2. Complete and Bring to Lab. Name: ______________________

1. a) Fill in the following table for the Riemann sum using regular partitions and right-hand endpoints.

$f(x)$	$[a,b]$	Δx	$x_i = a + i\Delta x$	$f(x_i)$	Wirte out Right$(n) = \sum_{i=1}^{n} f(x_i)\Delta x$ (Do not simplify yet)
$(x+1)^2$	$[0,3]$				

b) Simplify Right$(n) = \sum_{i=1}^{n} f(x_i)\Delta x$. No sum should appear. (Use back, if needed.)

c) Evaluate $\lim_{n\to\infty}$ Right(n). When $f(x)$ is continuous, this limit is denoted by $\int_a^b f(x)\,dx$. Here we would write $\int_0^3 (x+1)^2\,dx$.