Math 131 Homework: Day 02

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`.

For Fun

Hear the Rochester Philharmonic Orchestra at the Smith Opera House, This Friday, January 25 at 7:30 PM. Free! Higdon: Machine Larsson: Concertino for Trombone Beethoven: Symphony #1 Mozart: Symphony #40

Practice

1. Read Chapter 5.1 on the Estimation of Areas under Curves. Key terms: **regular partition**, **Riemann sum**, left and right Riemann sums, summation (sigma) notation.

2. Review your notes, including the Area Properties.

3. Working with sigma notation: Page 317 #31, 33,

4. Review Lab 1 Answers Online.

5. Antiderivative practice (some were listed last time): Page 301, #17, 21, 27, 33, 35 (see Example 4 on p. 297).

6. Area, displacement, and Sums: We will begin our discussion of estimating area under curves using summations next time. But given your work on Lab 1, Problem 4 and the material in the text you should be able to do Page 316, #9(a). To determine the heights of the rectangles, use the actual function $v(t) = 3t^2 + 1$ at the midpoints of the intervals. (You may want to use a calculator). Do not just estimate the height from the graph.

Hand In: Due Monday

0. **a)** Do the WeBWorK set Day02 (Due Monday Night.) It covers summations and some integral and derivative reviews.

b) Finish the earlier WeBWorK assignments today.

1. Page 317 #32(a,d).

2. Use Theorem 5.1 to evaluate the following: Page 317 #34(b,d,g). Also see WeBWorK set Day02 #1–3.

3. Use summation properties and formulæ (see Theorem 5.1) to evaluate the following general sums. Your answer will be in terms of n. [For part (c), square it first]. **Simplify all answers**. Also see WeBWorK set Day02 #4–6.

a) $\displaystyle\sum_{i=1}^{n} \left(\frac{2i}{n}\right)\left(\frac{2}{n}\right)$ **b)** $\displaystyle\sum_{i=1}^{n} \frac{i^2 - 10}{n^3}$ **c)** $\displaystyle\sum_{i=1}^{n} \left(1 + \frac{i}{n}\right)^2 \left(\frac{1}{n}\right)$

4. Evaluate the following limits using your answers to #3. [Do not redo the work in #3]. Use proper limit notation.

a) $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{2i}{n}\right)\left(\frac{2}{n}\right)$ **b)** $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \frac{i^2 - 10}{n^3}$ **c)** $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \left(1 + \frac{i}{n}\right)^2 \left(\frac{1}{n}\right)$

5. Chain rule review: Determine the **derivatives** of

a) $f(x) = 3\tan^4 x$ **b)** $g(x) = 6 + \ln(8x^5)$

6. The population P of a bacteria colony grows at the rate $\dfrac{dP}{dt} = k\sqrt{t}$, where t is time in days. The initial population was $P(0) = 500$ and the population after 1 day was $P(1) = 600$. Find the population function $P(t)$. (Review Lab 1, Problem #8 and its answer on line.)

7. Hand in Problem #12 on Lab 1. (Review Lab 1, Problem #11 and its answer on line.) Use the back of this sheet.

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12. Sometimes when we have no formula for a function we are forced to do graphical antidifferentiation. Let $F(x)$ be the antiderivative of $f(x)$ on $[-3, 4]$, where f is the function graphed below. Since F is an antiderivative of f, then $F' = f$. Use this relationship to answer the following questions.

a) Where is F' positive? Negative? Use F' to determine the interval(s) where F increasing. Decreasing.

b) At what x-value(s), if any, does F have a local max? Min?

c) Determine where F'' is positive and negative. On what interval(s) is F concave up? Down?

d) Does F have any points of inflection? If so, at which x-values??

e) Assume F passes through the point $(-3, 1)$ indicated with a $\bullet$; draw a potential graph of F.

f) Assume, instead, that F passes through $(-3, -1)$ indicated by a $\circ$; draw a graph of F.

g) What is the relationship between the two graphs you've drawn?