Midterm Exam Review.

- 4.8: Antiderivatives
  - Finding antiderivatives
  - DEF: antiderivative of a fn.
  - THM: most general antiderivative ("+C")
  - TABLE: antiderivative formulas
  - TABLE: —"— linearity rules
  - Initial Value Problems & Differential eq'ns
    - notation on IVPs / ODEs
  - Antiderivatives & Motion ($s(t)$, $v(t)$, $a(t)$)
  - Indefinite integrals
    - DEF: indef. integral

4.8: Problems: # 1, 7, 11–23 odd, 91–95 odd.

- Finding antiderivatives
- —"— indef. integrals } same?
- Initial value problems

Ch. 4: Questions to Guide Review

21: Are antiderivs. unique? If not, how related? Explain.

23: Solve $\frac{dy}{dx} = f(x)$.

24: What is an IVP? How do you solve one? Give example.

Midterm Review, ct'd

5.1: Area; Estimating w/ Finite Sums.

- Area

~~"upper" / "lower" sums~~ → superseded by Riemann sums later on

~~Distance traveled~~

- Average value of a function (nonneg., cts. fn.)

Formula for avg. value

5.1: Problems. # 1–7 odd, 15, 17

- Area
- Avg. value

5.2: Sigma notatn & Limits of Finite Sums.

- Finite sums, Sigma notatn
  - DEF: Sigma notation $\sum_{k=1}^{n} a_k = a_1 + a_2 + \cdots + a_n$
  - TABLE: Algebra rules for finite sums.
  - FORMULAS: · Sum of 1st n many integers
    · — " the squares of the 1st n many integers
    · " — cubes — "

~~Limits of Finite Sums~~ → superseded by Riemann sums

** • Riemann sums
  - DEF: partition, subintervals, Riemann sum, norm
  - Example in notes of Riemann Sums

5.2: Problems: # 1–45 odd · Sigma notat'n / evaluating sums; · Riemann sum

Midterm Review, ctd.

5.3: the definite integral

- DEF: Definite integral
  - Convergence of Riemann sums
- Integrable & nonintegrable functions.
  - Examples of integrable / non-integrable fns.
- Properties of definite integrals
  - TABLE: Rules satisfied by definite integrals
  - Min/max inequality
  - Proving rules in the table
- Area under graph of a non-neg. fn.
- Avg. val. of cts. fn.
  - Avg. val/mean of a continuous fn.

5.3: Probs.

1–13 odd : Interpreting limits of sums as integrals
Using def. int. rules

37–47 odd : Evaluating def. integrals

51–61 odd : Finding area
Finding avg. value

Midterm Review, ct'd.

☐ 5.4: Fund'l Thm. of Calculus

- MVT (THM) + one example
- FTC: Part I
- FTC: Part II
- Integral of a Rate
  - Net change theorem
  - applications
- Integration / Differentiation
- Total Area
  - relates def. integral to area btwn. curve & x-axis

5.4: Problems.

1–33 odd : Evaluating integrals

39–55 odd : Derivatives of integrals

65–69 : Initial value problems.

☐ 5.5: Substitution (indef.)

- "Chain rule backward"
  - THM: Substitution Rule
  - using subst. to evaluate $\int f(g(x))\, g'(x)\, dx$
  - TABLE: Integrals of tan, cot, sec, csc

5.5: Probs.

1–41 odd: Evaluating indef. integrals

☐ 5.6: Substitution for def. integrals

- THM: Subst. formula
- TWO METHODS
  - Transform bounds
  - use indef. integral/antiderivative

- Def. int. of even/odd fn. over a symmetric interval (THM)

- Areas between curves (DEF, EX.)
- Integrate w.r.t. y-variable.

5.6: Probs.

#1–39 odd: Evaluating Def. Integrals

Midterm Review

Chapter 5: Problems to Guide Review, p529

1: How to estimate distance travelled, area, avg. val. using finite sums? why?

2: Σ-notat'n, its advantages, give examples.

3: Riemann sum?

4: Norm of a partition?

5: Def. int. & area; interpretations

6: what is the def. int. of a fn. f over $[a,b]$? when can you be sure it exists?

* "if ... then ..." $\neq$ "if & only if"

11. Int/differentiat'n as "inverse" processes

12. How does FTC provide sol. to the IVP $\begin{cases} \frac{dy}{dx} = f(x) \\ y(x_0) = y_0 \end{cases}$ when f is cts.?

13. Substitut'n & Chain rule

14. —a— examples; indef.

15. —"— , def.

Midterm Review, ct'd

6.1 : Volumes

- Slicing by ∥ planes : $V = \int_a^b A(x)\,dx$
  - Algorithm for computing volume using above.
- Volume of solids of revol'n : $V = \int_a^b \pi [R(x)]^2\,dx$
  - Rotating abt. y-axis
  - Washer method

Problems : # 1-49 odd

- Slicing ≠ ∥ planes, • Disk (solids of rev.), • Washer

6.3 : Arc length

* $L = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\,dx$

Problems : # 1-25 odd, 26 : Finding lengths

6.4 : Areas of Surfaces of Revol'n

* $S = \int_a^b 2\pi y \sqrt{1 + (dy/dx)^2}\,dx$

Problems : # 5-17 odd : Finding surface area

Questions to Guide

1, 2, 4, 5.