CALCULUS 2 HOMEWORK

- This homework is based on: J. Stewart, "Essential Calculus" (early transcendentals), Cengage, 2010
- CAL2.1, etc. refer to the problems given in the online lecture notes. These notes are available at the course website.
- Problems indicated "for fun" are for math majors.
- It is crucial to do the homework as part of your preparation for the exams. To keep up, I recommend that **after every lecture you should solve the homework problems corresponding to the material covered on that day's lecture. Thus you need to work on a continuous basis!** Maintain a well-organized written record of your homework solutions by **writing the statement of each problem** (so that your document is stand-alone and can be read by itself), followed by your detailed solution, and clearly indicate the problem, section, and chapter number of the question. Most homework problems require more than simply writing the answer, and so you must write all steps of your solution and provide appropriate justification, as illustrated by the instructor's solved examples, as you would on a test or quiz. Write neatly and legibly, using rigorous mathematical notation. While you are encouraged to discuss homework problems with other students, tutors, your instructor, and other faculty, the write-up of your solutions must be your own work and not simply copied from another student or another source. Use a ring binder to collect your homework, and write with a black pen, as that will help you to later scan the ring binder as a PDF file, for possible future use, and as a form of backup. This will provide you with a readily available resource to prepare for tests and quizzes, as well as providing documentation of the homework problems should you have a question about a problem and seek help from the instructor or a tutor.

Integration by parts

- **General remarks**
  Read: Lecture Notes
  CAL 2.2: 1, 2, 3
- **Forms 1-6**
  Read §6.1
  CAL 2.2: 4,5,6
  §6.1: 3-10, 13, 14, 16-19
- **Miscellaneous integrals**
  CAL 2.2: 7, 8
  §6.1: 11, 12, 15, 20, 22, 24, 25, 26
- **Evaluating integrals by recursion**
  CAL 2.2: 9-12
  CAL 2.2: 13, 14 (for fun!!)
  §6.1: 44, 45, 46 (for fun!!)

Integrals of rational functions

- **Case 1: Denominator with distinct linear factors**
  CAL 2.2: 16, 17
  §6.3: 9, 10, 12, 13, 14, 17, 18
- **Case 2: Denominator with linear and repeated factors**
  CAL 2.2: 18
  §6.3: 19, 20
- **Case 3: Linear over irreducible quadratic**
  Read §6.3
  CAL 2.2: 15
  §6.3: 11, 27, 28
- **Case 4: Denominator with linear factors and an irreducible quadratic**
  CAL 2.2: 19
  §6.3: 19, 20, 22, 23, 29
- **Case 5: method of undetermined coefficients**
  CAL 2.2: 20
  §6.3: 24, 25, 26, 31, 32, 33, 34
- **Case 6: Functions requiring long division**
  CAL 2.2: 21
  §6.3: 7, 8, 16, 21, 30
- **Integrals that reduce to rational function integrals**
  CAL 2.2: 22, 22, 24, 25
  §6.3: 41, 42

Trigonometric Integrals

- **Forms $f(\sin x)\cos x$ and $f(\cos x)\sin x$**
  Read §6.2
  CAL 2.2: 26
  §6.2: 1-5, 13, 14, 16
- **Forms $f(\tan x)/\cos^2 x$ and $f(\cot x)/\sin^2 x$**
  CAL 2.2: 27, 28, 29
- **Forms $\tan^a x/\cos^b x$ and $\cot^a x/\cot^b x$**
  CAL 2.2: 30
  §6.2: 17, 18, 21-25, 28
- **Form: Products of trig functions**
  CAL 2.2: 31
  §6.2: 37, 38
- **Form: Squares of trig functions**
  CAL 2.2: 32, 33, 34, 35
  §6.2: 5-10
- **Method of desperation (tangent substitution)**
  CAL 2.2: 36, 37
  §6.2: 15, 19, 20, 26, 27, 29, 30, 36

Rationalizing substitutions

- **Form $\sqrt{a^2-(bx+c)^2}$**
  CAL 2.2: 38
  §6.2: 42, 49, 50, 53
- **Form $\sqrt{ax^2+bx+c}$ with $a>0$**
  CAL 2.2: 39
  §6.2: 43-48, 51, 52, 54-58
- **Form $\sqrt{(ax+b)^2-c^2}$**
  CAL 2.2: 40
  §6.2: 61, 64
- **Form $\sqrt{(ax+b)^2+c^2}$**
  CAL 2.2: 41
  §6.2: 62, 63

Improper Integrals

- **Improper Integrals of the first kind**
  §6.6: 5-22
  CAL 2.3: 1
- **Improper Integrals of the second kind**
  §6.6: 23-32
  CAL 2.3: 2
- **Convergence criteria for improper integrals**
  §6.6: 41-50
  CAL 2.3: 3,4

Sequences

- **Sequences and convergent sequences**
  Read §8.1
  §8.1: 9-11, 16, 20, 23, 24, 30, 31
  CAL 2.4: 1,2
- **Divergent sequences**
  Read §8.1
  §8.1: 17, 18
  CAL 2.4: 3, 4
- **Bounded sequences**
  Read §8.1
  §8.1: 22, 25, 26, 28
  CAL 2.4: 5,6,7
- **Recursive sequences and monotonicity**
  Read lecture notes
  §8.1: 42-44, 52b
  CAL 2.4: 8
- **Convergence and order**
  Read lecture notes
  §8.1: 14, 32
  CAL 2.4: 9,10

Series

- **Series whose limit can be calculated**
  Read §8.2
  §8.2: 9-21, 22-28, 35-37
- **Integral and comparison tests**
  Read §8.3
  §8.3: 6-8 (integral test)
  §8.3: 9-10 (comparison test)
  §8.3: 11, 12, 17-28
- **Ratio and root test**
  Read §8.4
  §8.4: 19, 26, 27, 39, 40 (ratio test)
  §8.4: 33, 34, 35 (root test)
- **Alternating and absolute convergence tests**
  Read §8.4
  §8.4: 20-24, 31, 32, 41, 42,44

Series approximation of functions

- **Power series**
  Read §8.5
  §8.5: 3-22
- **Uniform convergence of power series**
  Read Lecture Notes
  Study counterexamples in Online Lecture Notes
- **Properties of power series**

Read Lecture Notes and §8.6
§8.6: 34-37

- **Taylor expansion: 1. Term-by-term differentiation or integration**
  Read §8.6, §8.7
  §8.6: 3-12, 15-20, 21-24, 25-28
- **Taylor expansion: 2. Via convergence theorem**
  Read §8.7
  §8.7: 5-10, 27-32, 35, 43-46
- **Taylor expansion: 3. Binomial series**
  Read §8.7
  §8.7: 5 (2nd method), 23-26, 33, 34
  §8.8: 25, 28 (for fun)
- **Taylor expansion: 4. Product of series**
  Read §8.7
  §8.7: 55, 58

Parametric curves

- **Definition of parametric curves**
  Read §9.1
- **Calculus on parametric curves**
  Read §9.2 and lecture notes
  §9.2: 9-16, 22-26 (derivatives)
  §9.2: 27-31 (areas)
- **Arclength of parametric curve**
  Read §9.2 and lecture notes
  §9.2: 38-43, 49, 52
- **Arclength of a polar curve**
  Read §9.4
  §9.4: 33-36