CALCULUS 1 HOMEWORK

- This homework is based on: J. Stewart, "Essential Calculus" (early transcendentals), Thomson Brooks/Cole, 2012
- 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.** Do the assigned reading and problems in the specified order.
- CAL1.1, 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.

Preliminaries

- **Sets and Mappings**
  Read lecture notes
- **Functions and Domains**
  Read §1.1, §1.2
  Read lecture notes
  §1.1: 25-29, 33-35 (no sketching; only the domain)
  CAL1.1: 1,2

Limits

- **Definition of limit**
  Read lecture notes
  Read §1.3 (ignore the intuitive definition of the limit)
  CAL1.2: 1
- **Limits and Operations**
  Read §1.4
  §1.4: 11-28, 37-42
  CAL1,2: 2,3,4
- **Side limits**
  Read lecture notes
  Read §1.6
  §1.6: 13,14,15, 16, 17, 18
  CAL1.2: 5
- **Limits at infinity**
  §1.6: 19-27, 30-33
  CAL1.2: 6-10
- **Trigonometric limits**
  Read lecture notes
  Read §1.4
  §1.4: 33-36,49-56
  CAL1.2: 11,12
- **Continuity**
  Read §1.5
  §1.5: 29,30 ,33, 34
  CAL1.2: 13,14,15
  §1.5: 39-42, 43-44 (do only part (a))
  CAL1.2: 16-23
- **Asymptotes**
  Read lecture notes
  §1.6: 34, 35, 36 (no graphing calculator; find all asymptotes)
  CAL1.3: 1,2

Derivatives

- **Tangent problem–definitions**
  Read §2.1, §2.2
  §2.1: 3-6,49,50
  §2.2: 21-27,45,49
  CAL1.4:: 1-6
- **Derivative function**
  Read §2.3
  §2.3: 2-5, 9, 10
  Read §2.4 (product rule)
  CAL 1.4: 7-9, 12
  CAL 1.4: 10, 11, 13-15 (for fun)
- **Chain rule**
  Read §2.5
  §2.5: 1,2, 7,8,9,17-20
  CAL 1.4: 16, 17, 18
- **The quotient rule**
  Read §2.4 (quotient rule)
  §2.4: 11-18, 24-25
  §2.5: 21, 22, 24-26, 28, 34, 37, 38
  CAL 1.4: 19-22
- **Trigonometric functions**
  Read §2.4 (trigonometric functions)

§2.4: 7-10,19-22
§2.5: 12, 13, 14, 23, 29, 32, 33, 36, 39, 40, 41, 42
CAL 1.4: 23, 24

Foundation of differential calculus

- **Fermat/Rolle/Mean-Value theorem**
  Read §4.1,§4.2
  CAL1.5: 1,6
  CAL1.5: 2-5 (for fun)
- **Monotonicity and min/max**
  Read §4.3
  §4.3: 1-6, 11, 12 (no concavity)
  CAL1.5: 8-11
- **Concavity**
  Read §4.3
  §4.3: 25-31, 45
  CAL1.5: 12
  CAL1.5: 13, 14 (for fun)

Exponential and Logarithms

- **Exponential limits**
  Read §3.1
  Read lecture notes
  §3.1: 24-30
  CAL1.6: 1,2
- **Exponential derivatives**
  Read §3.3 (2nd part)
  §3.3: 19-24, 28, 30
  CAL1.6: 3-6
  CAL1.6: 7-9 (for fun)
- **Inverse functions**
  Read §3.2 (inverse functions)
  §3.2: 21,22,24,27 (no graphing calculators)
  CAL1.6: 10
  §3.2: 31-40
  CAL1.6: 11,12
- **The Natural Logarithm**
  Read §3.2 (logarithm)
  Read §3.3 (derivatives of logarithmic functions)
  §3.2: 23,25,26,69, 63-68
  CAL1.6: 13,14,15
  §3.2: 71-76
  CAL1.6: 22
  §3.3: 2-7, 9-18, 29, 33, 34, 42, 43, 47, 48
  CAL1.6: 16, 18,19
  CAL1.6: 17,20,21 (for fun)
- **General Exponential function**
  Read lecture notes
  §3.3: 25, 26, 40, 55-60
  CAL1.6: 23,25,24
  CAL1.6: 26,27 (for fun)
- **General logarithm**
  §3.2: 43-46, 72
  CAL1.6: 28, 29,31
  CAL1.6: 30,32

Other Inverse functions

- **Inverse trigonometric functions**
  Read §3.5
  §3.5: 1, 2a, 3, 4, 5, 7, 8-10
  CAL1.7: 1,2
  §3.5: 16, 17, 19-22, 24-29
  CAL1.7: 3, 4
  §3.5: 35-38
  CAL1.7: 5
- **Hyperbolic functions**
  Read §3.6
  §3.6: 1-4, 5b, 6, 9-15
  CAL1.7: 6,7
  §3.6: 19,20,22
  CAL1.7: 7-10
  CAL1.7: 11 (for fun)
- **De L'Hospital rule**
  Read §3.7
  §3.7: 1-38
  §3.7: 41, 42, 45 (for fun)
  CAL1.7: 13,12
  CAL1.7: 14,15 (for fun)

Introduction to integrals

- **Definition of the Riemann integral**
  Read §5.1, §5.2
  §5.2: 15-18, 25, 26, 53
  CAL1.8: 1,2,3
- **Fundamental theorem of calculus I**
  Read §5.4
  §5.4: 5-14, 24,28
  CAL1.8: 4,5,8
  CAL1.8: 6,7 (for fun)
- **Fundamental theorem of calculus II**
  Read §5.3
  §5.3: 4-15, 17, 28-30
  CAL1.8: 9,10
- **Method of substitution**

Read §5.5
§5.5: 37-40, 43-52, 11, 13-20, 22, 24, 31, 32

CAL1.8: 11, 12,14
CAL1.8: 13 (for fun)