MATH 128A Numerical Analysis Discussion Section

Raehyun Kim*

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General Information

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General Information

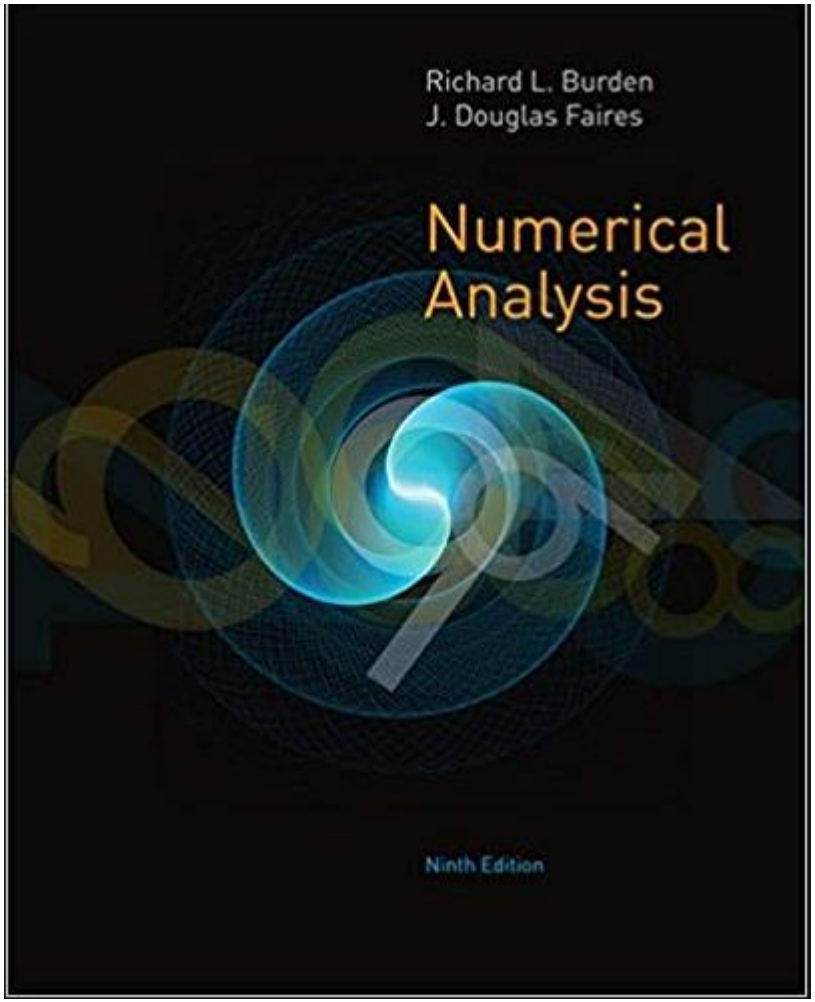
- Office Hours : Tue 1-3pm and by appointment

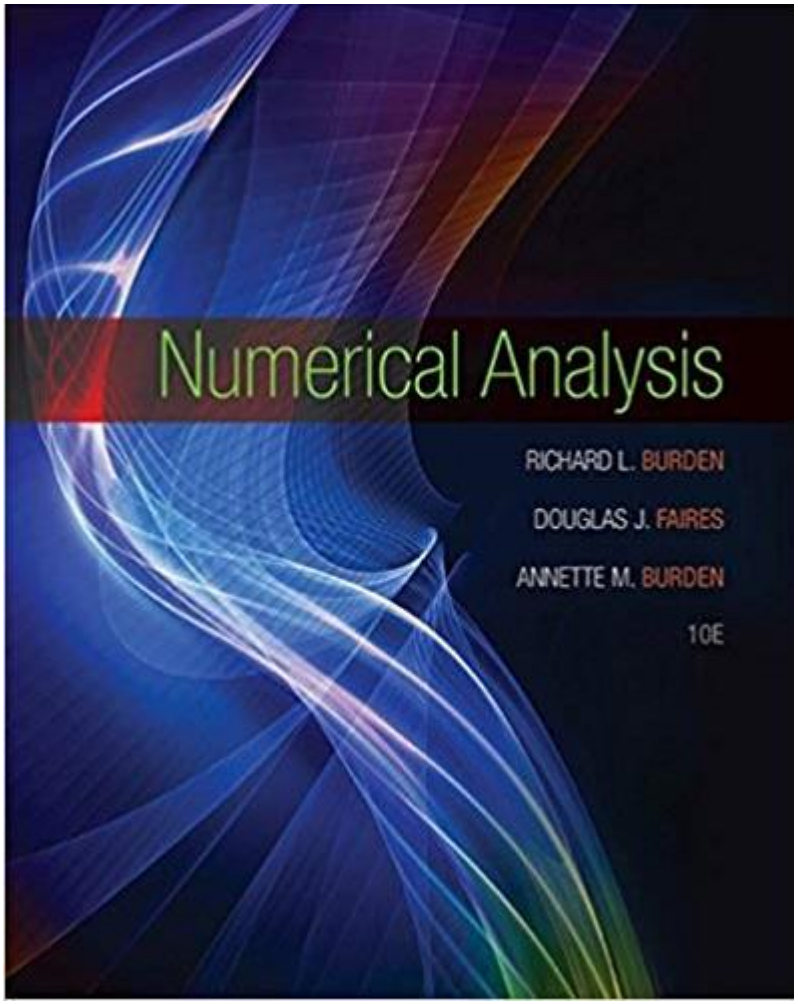
- Course Website : https://bcourses.berkeley.edu/courses/1518453

General Information

- Textbook : R. L. Burden and J. D. Faires, Numerical Analysis, 9-th or 10-th edition, Brooks-Cole

General Information





General Information

- Programming Language : MATLAB

- Quiz :
  Schedule - Sept. 7, Sept. 21, Oct. 5, Oct. 26, Nov. 9, Nov. 30.
  10 min / 2 problems
  No make-up quiz & the lowest score will be dropped

General Information

- Grades

INSTRUCTOR INFORMATION

Instructor: Prof. Ming Gu. Email: mgu@berkeley.edu

Office Hours: MT 4:00-5:30PM (Online, Zoom ID: 921 3397 4699) or in person by appointment.

GSI: Yanshuai Qin <ysqin@berkeley.edu>; Raehyun Kim <rhkim79@berkeley.edu>; Jiaming Wang <jiaming_wang@berkeley.edu>
Office Hours: Yanshuai Qin (Evans 812) Fridays 5:00-7:00PM, Raehyun Kim (Evans 743) Tuesdays 1:00-3:00PM, Jiaming Wang (Evans 816) Thursdays 10:00-12:00Noon

Home work: due on Wednesdays on gradescope. Homework is worth up to 1.5 points each, maximum 15 points.

Midterm exam (Oct. 12), 20 points.

Programming Assignment (Due Nov. 16), 20 points.

Final exam (Fri 12/16/22, 11:30AM -- 2:30PM), 30 points. Final worth 50 points if midterm missing (no excuse needed)

QUIZ SCHEDULE: Sept. 7, Sept. 21, Oct. 5, Oct. 26, Nov. 9, Nov. 30. Quiz is worth up to 3 points each, maximum 15 points.

GRADE SCALE

A- to A+: at least 85 points
B- to B+: between 70 and 85 points
C- to C+: between 60 and 70 points
D: between 55 and 60 points
F: less than 55 points.
No grade curve: your grade will be your own effort

IMPORTANT LINKS: gradescope https://www.gradescope.com/ (Entry Code:RZKN43)

Brief Review of Calculus

- Several Theorems from Calculus
  - Mean Value Theorem
  - Extreme Value Theorem
  - Intermediate Value Theorem
  - Taylor expansions

Brief Review of Calculus

- Differentiation Rules
  - $(C)' = 0$
  - Linearity rule $(af + bg)' = af' + bg'$
  - Product rule $(fg)' = f'g + fg'$
  - Power rule $(f^n)' = nf'f^{n-1}$
  - Quotient rule $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$
  - Chain rule $(f(g(x)))' = f'(g(x))g'(x)$

Brief Review of Calculus

- Differentiation Formulas
  - $\frac{d}{dx}(\log x) = \frac{1}{x}$
  - $\frac{d}{dx}(a^x) = a^x \log a$
  - $\frac{d}{dx}(\sin x) = \cos x$
  - $\frac{d}{dx}(\cos x) = -\sin x$
  - $\frac{d}{dx}(\tan x) = \sec^2 x = 1 + \tan^2 x$

Brief Review of Calculus

- Basic theorems
  - IVT(most commonly used variation)
    - For $f \in C[a,b]$,
      $f(a)f(b) < 0 \rightarrow \exists c \in (a,b)\ s.t.\ f(c) = 0$
  - MVT
    - For $f \in C[a,b]$ and f is differentiable on (a,b),

$$\exists c \in (a,b)\ s.t.\ f'(c) = \frac{f(a) - f(b)}{a - b}$$

  - EVT
    - If $f \in C[a,b]$, then f has extreme values.
      If f is differentiable then it has extreme values at endpoints or stationary points

Brief Review of Calculus

- $f(a)f(b) > 0$
  - If f is differentiable, then use extreme value thm.
  - If f is not differentiable, then there's not much we can do.
- $f \in C^1[a,b] \leftrightarrow f \in C[a,b]$ & f is differentiable?
  - No
  - $f(x) = x^2 \sin\left(\frac{1}{x}\right)$ $x \neq 0$ and $f(0) = 0$