Graded Quiz # 5

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7/10 points (graded)

Please write below your BracU ID and Section Number. After submission, these may show WRONG answers. Please IGNORE these messeges. Your score will be based on the questions below these two inputs:

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Your BracU ID#:

19101239 ✖

Your theory class section#

- [ ] 1
- [ ] 2

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- [ ] 3
- [ ] 4
- [ ] 5
- [x] 6

✖

MCQs start from below. Answer the questions correctly:

=====

Q#1: How many roots of $\cos(x)$ are there in the interval $[0, 42]$?

- (•) 13
- ( ) 17
- ( ) 18
- ( ) 7

✔

Q#2: A function $f(x)$ has only one root in the interval from $a = 0.3$ to $b = 0.4$ And it is also given that $f(a) = 1.4$ and $f(b) = -1.1$ If $f(c) > 0$ where $c = (a + b)/2$ in which of the fllowing sub-interval does the root exist?

- (•) $[0.35, 0.4]$

- ◯ $[1.4, -1.1]$.
- ◯ $[0.3, 0.35]$.
- ◯ $[0.3, 0.4]$.

✔

Q#3: In the interval $[-5, -4.5]$there lies only one root of a given polynomial. What is the number of iterations needed to successfully find the root using the interval bisection method if given that machine epsilon = 5.96×10^{-8}?

- ◯ 48.
- ◯ 47.
- ◯ 24.
- ◉ 23.

✖

Q#4: In an interval $[5, 6.5]$, it takes 63 iterations to find the root using the bisection method. What is a possible value of the machine epsilon?

- ◯ 8.5×10^{-20}.
- ◯ 8.7×10^{-20}
- ◯ 8.3×10^{-20}

- 8.1×10^{-20}.

Q#5: Which of the following is/are not a non-linear function(s)?

- $f(x) = 1/x$
- $f(x) = \sin(x)$
- $f(x) = 3x^2 + .5$
- $f(x) = 3x + .7$
- All of the above.

Q#6: Let $f(x) = e^x \cos(0.5x)$. Find the value of $f'(1)$ with $h = 0.1$ using the central difference method.

- 1.7334.
- 2.7225.
- 1.7319.
- 2.7191.

Can't load web font TeX/Main/Regular $\cos(0.5x)$. Find the value of $f'(1)$ with

$h = 0.05$ using the central difference method.

- ○ 2.7191.
- ◉ 1.7334.
- ○ 1.7319.
- ○ 2.7225.

✔

Q#8: Let $f(x) = e^x \cos(0.5x)$. Now, compute $D_h^{(1)}$ using the Richardson Extrapolation formula with $h = 0.1$ and $h/2 = 0.05$. (If you are confident, you may also use the results found in the previous two questions instead of recalculating).

- ○ 1.7314.
- ○ 2.7180.
- ◉ 1.7339.
- ○ 2.7236.

✔

Submit You have used 1 of 1 attempt

Question #9 :Read the following question carefully. The question is long, but the answer is very short and can be completed in three lines only.

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In Richardson extrapolation method, starting from the expressions

$$D_h \equiv \frac{f(x+h) - f(x-h)}{2h}$$

and using Taylor expansion and replacing h by $h/2$in D_h, we derived the following formula

$$D_h^{(1)} \equiv \frac{2^2 D_{h/2} - D_h}{3} = f'(x) - \frac{h^4}{480} f^{(5)}(x) + \mathcal{O}(h^6) \ ,$$

which is 4th-order accurate. This is done is lecture note and also in the video lecture. Here in this question we will repeat the above procedure by replacing the parameter h by $h/3$(instead of $h/2$), and find the formula for $D_h^{(1)}$. To do so follow the following steps:

1. [1 Marks] Write down the Taylor expanded forms of D_h and $D_{h/3}$ upto order of $\mathcal{O}(h^8)$.
2. [1 Mark] Now define $D_h^{(1)}$ in terms of D_h and $D_{h/3}$ and use the expressions in the previous part to simplify. Is your result 4th-order accurate? Your answer should be in the following form

   $$D_h^{(1)} = f'(x) + \text{New term} + \mathcal{O}(\text{Powers of } h) \ ,$$

   and you should find an algebraic expression for the `New term' and indicate the power of h in the last term, like the expression as in the right-hand side of the second equation above.

Note: Follow the instructions below to submit the `Problem Solving' part.

GRADED QUIZ # 5 SUBMISSION

Status

You have completed this assignment. Your final grade will be available when the assessments of your response are complete.

Your Response due Aug 19, 2021 21:00 +06 (in 0 minutes) ✔ COMPLETE

Staff Grade NOT AVAILABLE

Check back later to see if a course staff member has assessed your response. You will receive your grade after the assessment is complete.

Your Grade: Waiting for Assessments

You have completed your steps in the assignment, but some assessments still need to be done on your response. When the assessments of your response are complete, you will see feedback from everyone who assessed your response, and you will receive your final grade.

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