

Instructions: \implies

If you do not read the instructions, then how will you know what to do? Read them now.

Be sure to write your name in the space above.

- You may use one note-sheet prepared in advance. You must put your name on your note-sheet, but do not turn in your note-sheet. Your note-sheet must be letter size, 8.5×11 inches, or A4 paper, 21×29.7 cm, or smaller. You may write on both sides of your note-sheet.
- Note-sheets may not be shared. If you do not bring a note-sheet you will have to do without any help notes.
- You may not use any books, notebooks nor additional note-sheets.
- You may use a calculator. Calculators and other equipment may not be shared.
- For multiple-choice problems indicate your choice in the answer box provided. You need not show any work nor offer any explanations for your answer. If you need to do some work, you may do it in the space provided, if any, or on the back of the examination sheets, but your work will not be graded. **You will be graded only on the letter you select and put in the provided answer box.** Note this test does not use a scantron.
- Use the backs of the examination sheets for scratch work.

Please note $\log(x)$ means the natural logarithm of x on this test.

Note: Some problems may have more than one technically “correct” answer. In that case the best answer receives full credit, whereas correct, but not best, answers receive partial credit. For example, a small integer greater than 5 is probably 6, whereas 10^9 is also technically correct, but probably not best (depending on what other selections are available). Problems with partial credit are indicated by multiple points, e.g., 20,5.

Problem 1. (20,10 points if correct, 0 points if wrong). Consider a (very unrealistic) computer with floating point numbers with a mantissa of length only 12 bits. Assume the mantissa is not packed and in addition that chopping is used to fit numbers to the limited storage. Assuming no problem storing the exponent, which of the following numbers is closest to the error made in storing 13.2?

- A.) 0 B.) 0.2
C.) 0.0007 D.) 0.0008 E.) 0.0009

← Letter corresponding to your answer to problem 1.

Problem 2. (20,5 points if correct, 0 points if wrong). If $f(x) = e^{\sin(x)}$ then the Taylor polynomial of degree 5 of f is given by

$$p(x) = 1 + x + \frac{1}{2}x^2 - \frac{1}{8}x^4 - \frac{1}{15}x^5.$$

We can show $|f^{(6)}(\xi)| \leq 58$ for $0 \leq \xi \leq 1$. Use this estimate of $|f^{(6)}(\xi)|$ to estimate the error in $p(1/2)$ as an approximation of $f(1/2)$. Choose the closest number below.

- A.) 1.61510 B.) 0.08056
C.) 0.001259 D.) 0.000396 E.) 0.000042

← Letter corresponding to your answer to problem 2.

Problem 3. (20 points if correct, 0 points if wrong). Use Simpson's rule with 4 subintervals to estimate $\int_0^1 x^4 dx$.

Choose the closest answer.

- A.) 0.2005208 B.) 0.2083333
C.) 0.2000133 D.) 0.2000000 E.) 0.1998633

← Letter corresponding to your answer to problem 3.

Problem 4. (20 points if correct, 0 points if wrong). Find the least-squares line fit to the data points (0, 0), (1, 1), (2, -1), (3, 2).

- A.) $y = x$ B.) $y = \frac{2}{5}x - \frac{1}{10}$
C.) $y = \frac{2}{5}x - \frac{1}{5}$ D.) $y = \frac{2}{3}x + \frac{1}{10}$ E.) None of the foregoing.

← Letter corresponding to your answer to problem 4.

Problem 5. (20 points if correct, 0 points if wrong). If

$$s(x) = \begin{cases} x^3, & 0 \leq x \leq 1 \\ p(x), & 1 < x \leq 2 \end{cases}$$

which of the following choices of $p(x)$ makes $s(x)$ a cubic spline on $[0, 2]$?

- A.) $p(x) = x^3 - x + 1$ B.) $p(x) = 3x^2 - 3x + 1$
C.) $p(x) = 4x^2 - 4x + 1$ D.) $p(x) = x^3 + x - 1$ E.) None of the foregoing.

← Letter corresponding to your answer to problem 5.

Problem 6. (20 points if correct, 0 points if wrong). Find the interpolation polynomial of degree at most 3 for the points (0, 0), (1, 1), (2, -1), (3, 2).

- A.) $y = \frac{3}{2}x^3 - 6x^2 + \frac{11}{2}x$ B.) $y = \frac{7}{6}x^3 - 5x^2 + \frac{29}{6}x$
C.) $y = \frac{4}{3}x^3 - \frac{11}{2}x^2 + \frac{31}{6}x$ D.) $y = \frac{7}{3}x^3 - \frac{17}{2}x^2 + \frac{43}{6}x$ E.) None of the foregoing.

← Letter corresponding to your answer to problem 6.

Problem 7. (20, 10 points if correct, 0 points if wrong). For a certain function f we have trapezoidal estimates of $\int_1^2 f(x) dx$ as follows: $T_2 = 0.33189$, $T_4 = 0.35947$ and $T_8 = 0.36648$. Use extrapolation to compute the Simpson's estimate S_4 . Pick the closest number.

- A.) 0.36862 B.) 0.36882
C.) 0.36881 D.) 0.36649 E.) 0.36866

← Letter corresponding to your answer to problem 7.

Problem 8. (20 points). Write one or two brief paragraphs describing the topic in Mth 351 (so far) that you enjoyed most, or found most useful. You may wax poetic, but you must include some technical information. Humor is great if tasteful and relevant.

Additional test policies for this class are provided on my web page <http://ucs.orst.edu/~peterseb>.

Use this space for scratch work.

Please do not write in the boxes to the right. They are for your grades. Do not be concerned if there are more boxes than problems.

										Letter Grade
										<input type="checkbox"/> <i>This test only</i>
										<input type="checkbox"/> <i>Cumulative</i>
1	2	3	4	5	6	7	8	9	10	Total

Note: There are 8 problems for a total of 160 points.