

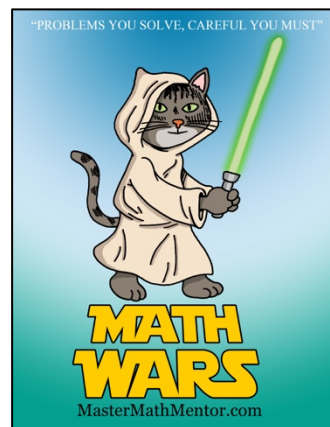
Math Wars – BC Calculus

Topic 212 – Lagrange Error

Maximum Time: 9 Minutes



Directions: To start, you need to download the Math Wars application on your cell phone: Use the QR code or the url: <https://mastermathmentor.com/mmm/mathwars.ashx?key=212>



When ready, start the timer and then solve the problems below, entering your choice, A, B, C, D and pressing for each problem when you are sure of your answer. When complete, stop the timer. You will see problems you got correct in green and incorrect in red. You will receive a score based on how many problems you got right and your time. A perfect score is all problems correct using half the maximum time or less. You can text or email your friends with your results.

1. (1 pt) Let f be a function having derivatives for all orders of real numbers. The function and its first three derivatives at $x = 3$ are given in the table to the right. The fourth derivative of f satisfies the

x	$f(x)$	$f'(x)$	$f''(x)$	$f'''(x)$
3	2	-3	0	-4

inequality $|f^{(4)}(x)| \leq 80$ for all x in the interval $[3, 5]$. Find an expression representing the Lagrange Error.

- A. $\frac{(x-3)^4}{80}$ B. $20(x-3)^4$ C. $\frac{10(x-3)^4}{3}$ D. $80(x-3)^4$

2. (3 pts) The approximation $e^x \approx 1 + x + \frac{x^2}{2}$ can be used when x is small. Find the maximum error when using this formula to approximate e^x when $x \leq 0.25$.

- A. 1.28403 B. 1.28069 C. 0.00260 D. 0.00334

3. (5 pts) Let f be a function having derivatives for all orders of real numbers. The function and its first three derivatives at $x = 1$ are given in the table to the right. The fourth derivative of f satisfies the

x	$f(x)$	$f'(x)$	$f''(x)$	$f'''(x)$
1	2	0	3	-12

inequality $|f^{(4)}(x)| \leq 24$ for all x in the interval $[1, 2]$. Find the maximum value of $f(1.5)$.

- A. $\frac{1}{16}$ B. $\frac{21}{16}$ C. $\frac{17}{8}$ D. $\frac{35}{16}$

4. (7 pts) We use the 4th degree Maclaurin polynomial to approximate $\cos(0.5)$. Our approximation is off by less than one of the numbers below. Which is the best in describing the error?

- A. $\frac{0.5^5}{5!}$ B. $\frac{0.5^6}{6!}$ C. 0.5^5 D. 0.5^6

5. (9 pts) Find the maximum error in using the 2nd degree Taylor polynomial about $x = 4$ for $f(x) = \sqrt{x}$ to compute $\sqrt{5.5}$.

- A. 0.01171 B. 0.01977 C. 0.00659 D. 0.07655