0. (2 points, 1 point for recognizability and 1 for last name spelled correctly)

TA Name: ________________________

1. (3 points) Calculate the \( n \)-th Taylor polynomial for \( e^x \).

2. (3 points) What is the remainder term for problem (1)?
3. (3 points) Calculate the Taylor series for $e^x$?
4. (3 points) Show the Taylor series for $e^x$ in (3) converges for all $x$. 

5. (3 points) Show that the limit of $x^n/n!$ as $n$ goes to infinity is zero for arbitrary $x$. 
6. (3 points) Show the Taylor series for $e^x$ in (3) converges to $e^x$ for all $x$. 
7. (3 points) What is $p_3(x)$ for $e^x$?

8. (3 points) Estimate $e^{3/10}$ using $p_3(x)$. Use 4 decimal places.
9. (3 points) What is the remainder $e^x - p_3(x)$?
10. (3 points) Find a bound on the remainder in (8) when $x = .3$. Assume that you know $e^{.3}$ is less than 1.5. Use 4 decimal places.
11. (3 points) Trap $e^{-3} = e^{3/10}$ between two numbers using the above and 4 decimal places.
(Note: $e^{-3} = 1.349858808...$)
12. (3 points) Let \( f(x) \) be a function with \( f(1) = 1, \ f'(1) = 2, \ f''(1) = 2, \) and \( f^{(k)}(1) = 0, \ k > 2. \) What is the Taylor series for this function at \( a = 1? \)

13. (3 points) Simplify the function in (12).
14. (3 points) Let $f(x) = \sum_{n>0} (-1)^{n+1} \frac{x^n}{n!}$. Show this converges for all $x$. 
15. (3 points) What is $p_3(x)$ for the function in (14)?

16. (3 points) Evaluate $p_3(.2)$ in (15). Use 6 decimals.
17. (3 points) Get an estimate on $f(.2) - p_3(.2)$ for the function of (14-16). Use 6 decimals.
18. (3 points) Trap the function, \( f(.2) \) (of 14-17), using \( p_3(.2) \) and the above remainder. Use 6 decimals. (Hint: \( f(.2) = .195144057\ldots\))
19. (3 points) Let \( f(x) = \sum_{n>0} \frac{x^n}{n!} \). Assume this converges for all \( x \). Use \( p_1(x) \) to approximate \( f(3) \).
20. (3 points) Get a bound on $f(x) - p_1(x)$ for $x = .3$ for $f(x)$ in (19). Use 4 decimals.
21. (3 points) For the $f(x)$ in (19-20), trap $f(.3)$ between two numbers using the above. Use 4 decimals. (Hint: $f(.3) = .3117$....)

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