

10. [6 points] The Taylor series centered at $x = 0$ for a function $F(x)$ converges to $F(x)$ for $-e^{-1} < x < e^{-1}$ and is given below.

$$F(x) = \sum_{n=0}^{\infty} \frac{(n+1)^n}{n!} x^n \quad \text{for } -\frac{1}{e} < x < \frac{1}{e}.$$

- a. [2 points] What is $F^{(2018)}(0)$? Make sure your answer is exact. You do not need to simplify.

Answer: $F^{(2018)}(0) =$ _____

- b. [4 points] Use appropriate Taylor series for $F(x)$ and $\cos(x)$ to compute the following limit:

$$\lim_{x \rightarrow 0} \frac{(F(x) - 1)(\cos(x) - 1)}{x^3}$$

Show your work carefully.

Answer: $\lim_{x \rightarrow 0} \frac{(F(x) - 1)(\cos(x) - 1)}{x^3} =$ _____