# MATH 201. More problems on Taylor series and applications.

- a- Find the MacLaurin series for the function $f(x) = xe^x$.

  Does this series converge to $f(x)$ ? If so, over which interval?

  b-Conclude a value for the sum $\sum_{n=0}^{\infty} \frac{n+1}{n!}$.

- Let $f(x) = \frac{x}{1+2x}$
  a) Find its Maclaurin series.
  b) Conclude a value for $f^{(7)}(0)$

- a- Let $f(x) = 2x^3 + x^2 - x + 3$. Find its Taylor polynomial of order 3 around $a = 1$.

  b- Expand the polynomial obtained. What do you observe? Why?

- Use the known geometric series $\frac{1}{1-r} = 1 + r + r^2 + r^3 + r^4 + \ldots$ for $-1 < r < 1$ to express $f(x) = \frac{1}{7-2x}$ as a Taylor series around $a$=3.

- a-Use a known MacLaurin series to evaluate $\lim_{x \to 0} \frac{1 - \cos x}{1 + x - e^x}$.

  b-Write the indefinite integral $\int \sin\left(x^2\right)dx$ as an infinite series.

- **a-**Write the Maclaurin series for $f(x) = \frac{1}{1-x}$

  **b-**Conclude the Maclaurin series for $\tan^{-1}\left(x^2\right)$

  c- Conclude the value of the following sum $\sum_{n=0}^{\infty} (-1)^n \frac{1}{4n+2}$

- a. Write the Maclaurin series for $e^{-x^2}$.

  b- Determine where the series $\sum_{n=1}^{\infty} \frac{(-1)^n 2n}{n!}$ converges to.