NAME AND SURNAME	INDEX NUMBER	GROUP

TEST I *November 16th*

Ex 1. *(3 pts.)* Using the sequence of partial sums S_n establish if the series $\sum_{n=2}^{\infty} \ln(1-\frac{1}{n})$ is convergent or divergent.

Ex 2. *(1 pt.)* a) Give a definition of a ratio test.

(2 pts.) b) Find if the series $\sum_{n=1}^{\infty} \frac{(n+3)!}{n!\cdot 3^n}$ is convergent or divergent using any appropriate method.

Ex 3. *(3 pts.)* Establish if the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[4]{n^\pi}}$ is divergent, conditionally convergent or absolutely convergent. Justify each condition of the alternating series with at least one sentence.

Ex 4. *(1.5 pts.)* a) Calculate the limit $\lim_{(x,y)\to(0,0)} \frac{\sin(x-y)}{\cos(x+y)}$.

(1.5 pts.) b) Show that the limit $\lim_{(x,y)\to(0,0)} e^{\frac{x^2-y^2}{x^2+y^2}}$ does not exist using any method you wish.

Ex 5. *(3 pts.)* Find all first and second derivatives of $f(x, y) = e^x(3 - y^2)$.

Ex 6. *(4 pts.)* Find all extremes and saddle points of $f(x, y) = x^3 + 8y^3 - 6xy + 2$.

Ex 7. *(1 pt.)* Calculate the approximated value of $(1.01)^2 + 2 \cdot (2.05)^3$ and find all errors.

(2pt bonus.) Give an equation of the tangent plane Π to the surface of $f(x, y) = \frac{x^2 - y^2}{2}$ at point $P = (2, 2, 0)$.