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

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

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

Ex 3. (3 pts.) Establish if the series $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$ 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 $\lim_{(x,y) \rightarrow (1,2)} \frac{\sin(2x-y)}{2x^2-xy}$.

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

Ex 5. (3 pts.) Find all first and second derivatives of $f(x, y) = \sin(x, y)$.

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

Ex 7. (1 pt.) Calculate the approximated value of $(0.99)^2 + 2 \cdot (2.07)^3$ 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 $P = (2, 2, 4)$.