NAME AND SURNAME

TEST I *November 27th*

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

Ex 2. *(1 pt)* Apply the necessary condition for convergence to the series $\sum_{n=1}^{\infty} \frac{1}{n^{1.01}}$.

Ex 3. *(1 pt)* An infinite number of mathematicians come into a pub. The first mathematician asks the bar-tender for 1 pint of beer, the second mathematician asks for $\frac{1}{2}$ pint of beer, the third mathematician asks for $\frac{1}{4}$ pint of beer, etc... But the bar-tender just smiles and pours them 2 pints of beer altogether. Why are two pints of beer enough — explain mathematically :) What type of a series should you use?

Ex 4. *(2+1 pts)* a) Establish the convergence of the series $\sum_{n=1}^{\infty} \tan^n(\frac{\pi}{3} - \frac{2}{n})$ using an appropriate test.

b) Write the name and the definition of the test you used in Exercise 4a.

Ex 5. *(2 pts)* Calculate f'_{xyzyx} for $f(x,y,z) = x^6 z^5 y^4 + z^2 \ln(y) + x \sin z + y \cos x$.

Ex 6. *(3 pts)* Establish if the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n\sqrt[3]{n}}$ is divergent, conditionally convergent or absolutely convergent. Justify each condition of the alternating series with at least one sentence.

Ex 7. *(4 pts)* Find all extremes and saddle points of $f(x,y) = x^4 + 8x^2 + y^2 - 4y$.

Ex 8. *(2 pts)* Calculate the approximated value of $(1.02)^4 \cdot (0.97)^2$ - you don't need to find any errors, since you are not allowed to use a calculator on the test.

Ex 9. *(2 pts)* Show that the limit $\lim\limits_{(x,y)\to(0,0)} e^{\frac{x^2+y^2}{x^2-y^2}}$ doesn't exist using any method you like.