MA 1023

Calculus III

Conference 1 − Ideas
Covers material from Lecture 4-6
& Active Learning 2

1. Calculate the following improper integrals:

$$\text{a)} \quad \int_1^\infty \frac{\left(\ln(w)\right)^2}{w}\, dw \qquad\qquad \text{b)} \quad \int_{-1}^\infty \frac{1}{|z+2|^5}\, dz$$

2. Do the following integrals converge or diverge? Explain your answer carefully. Note that you do not have to calculate the integrals explicitly for that.

$$\text{a)} \quad \int_1^\infty \frac{\left(\arctan(x)\right)^3}{x^2}\, dx \qquad\qquad \text{b)} \quad \int_1^\infty \frac{2+\cos(y)}{\sqrt[3]{y}}\, dy$$

3. For which values of p does the following integral converge?

$$\int_e^\infty \frac{1}{x\left(\ln(x)\right)^p}\, dx$$

4. Explain what it means to say that

$$\int_{-\infty}^3 f(x)\, dx, \qquad f(x) \geq 0.$$

   diverges. Your answer might be a mix of text, graphics and mathematical expressions.

5. Let $P_n(x)$ be a n-th degree polynomial. What can we conclude about the improper integral

$$\int_1^\infty \frac{P_n(x)}{5x^n + 1}\, dx$$