ETMAG, Exam 3 (60 minutes)

Question1	Question2	Question3	Question4	Question5	Sum	Exercises	Total

## Name: Index number:

Question 1. Examine monotonicity of the following function and find its extreme values:

$$f(x) = |x|(x-1)^2$$

Question 2. Find all eigenvalues and eigenvectors of the following matrix over  $\mathbb{R}$ . For each eigenspace find its basis and dimension.

$$\left(\begin{array}{rrrr} -5 & -3 & -3 \\ 6 & 4 & 3 \\ 0 & 0 & 1 \end{array}\right)$$

Question 3. Calculate, if possible, the following limits or show they fail to exist:

$$\lim_{x \to \infty} x \arctan\left( (-1)^{[x]} \cdot x \right), \qquad \qquad \lim_{n \to \infty} \sqrt[n]{3^n \cdot \sin n + 4^n}.$$

Question 4. Find all asymptotes of the function

$$f(x) = \frac{1}{x} + x \arctan x.$$

Question 5. Calculate

$$\frac{(1-\sqrt{3}i)^{100}}{(-1-i)^{200}} \qquad \sqrt[3]{-32}.$$