FINAL EXAM, DIFFERENTIAL AND INTEGRAL CALCULUS I, MS-A0111

- Time: 12.12.2019, 09:00-12:00
- Equipment: One sheet (A4) of hand-written notes, written on one side only.
- Answer each problem on a separate page. Each problem is worth 4 points.
- Motivate all solutions carefully. Answers without motivation give no points.
- Simplify all solutions as far as possible.
- Good luck, have fun! /Ragnar

PROBLEM 1

Compute the limit

$$\lim_{x \to 0} \frac{\sin x - \sqrt{x}}{x}.$$

PROBLEM 2

Sketch the function graph

$$y = \frac{x^3 + x^2}{x^3 - 1}.$$

PROBLEM 3

Sketch the function graph

$$y = x^{\frac{1}{x}}$$

for $x > 0$.

PROBLEM 4

Compute

$$\int_0^2 \frac{x^2}{x^3 + 1}\, dx.$$

PROBLEM 5

Find all the solutions to the differential equation

$$y'' - 3y' + 2y = \mathrm{e}^x + \sin x.$$