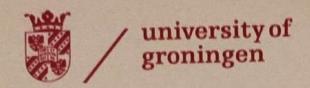
## Calculus 1

Resit Exam

November 26, 2024 (18:30-20:30)



## Please read the instructions!

- 1) Apply L'Hospital's Rule to evaluate the limit  $\lim_{x\to 0}\frac{a^x-a^{\sin x}}{x^3}$  for all a>0. Indicate the results (e.g. limit laws, continuity, differentiation rules) used in each step.
- 2) Use Taylor Series to find the limit  $\lim_{x\to\infty}\left[x-x^2\ln\left(1+\frac{1}{x}\right)\right]$ . Justify each step.
- 3) Use integration to calculate the total length of an astroid curve given by the equation  $x^{2/3} + y^{2/3} = c^{2/3}$ , where c is a positive constant.
- 4) Evaluate the definite integral  $\int_1^2 \frac{x+2}{x\sqrt{4-x^2}} \, dx$ .
- 5) Solve the initial value problem  $y'(x) + xy(x) = x^3$ , y(0) = 1.
- 6) Solve the following initial value problem

$$y''(x) + 2y'(x) + 2y(x) = 0$$
,  $y(0) = 1$ ,  $y'(0) = -3$ .