1. Consider a function $f(x) = \sqrt{x^2 + 6x + 3} - \sqrt[3]{x + 1}$.
   - Find a maximal domain of f (i.e., find all $x \in \mathbb{R}$ for which is $f(x)$ well defined.)
   - Write down a definition of even function and a definition of odd function.
   - Determine, whether the function is even, odd or none of these. Proof your claim.

2. Write down a rule for the derivative of sum, product, quotient and composition of two functions f and g. Use these rules to compute f' and f'' where f is defined as
$$f(x) = x \log(1 + x^3).$$

3. Examine the course of function
$$f(x) = \frac{x^4}{(1 + x^3)}.$$
(Recall that the following six steps are needed: 1, determine the domain. 2, examine parity, intersections with axis etc. 3, examine the behavior of the function on the edges of the domain. 4, examine the monotonicity of the function (and determine local maxima/minima). 5, examine convexity/concavity (and points of inflexion). 6, draw a sketch of a graph)

4. Consider an equation
$$y'' + 4y' + 8y = \sin x + e^x$$
   (a) Find all solution to the appropriate homogeneous problem.
   (b) Use a 'special right hand side' method to deduce one particular solution (it is needed to split the right hand side into two parts).
   (c) Write all solutions to the given problem.
   (d) Find a particular solution fulfilling $y(0) = 1$, $y'(0) = 0$.