Mathematics with Computer Science

Introductory Course Winter Semester 2008/2009 Technische Universität Darmstadt Fachbereich Mathematik Dennis Frisch



Exercises Unit 8

- 1. Determine the tangent at x_0 :
 - (a) $f(x) = 2x^3 7$, $x_0 = -1$.
 - (b) $f(x) = \frac{1}{x}$, $x_0 = \frac{1}{2}$.
- 2. Does $\lim_{x \to x_0} \frac{f(x_0) f(x)}{x_0 x}$ exist for the following function?

$$f(x) = |x^3|, \quad x_0 = 0$$

Use the definition of differentiability to decide if the function is differentiable in $x_0 = 0$.

- 3. Write the following function as a composition of simpler functions and calculate their derivatives using the chain rule: $f(x) = \sqrt{(2x^2 + x)^3 + 1}$
- 4. Show, that $(f \pm g)' = f' \pm g'$.
- 5. Use the product rule and the chain rule to prove the quotient rule.
- 6. Decompose a fixed real number c into two summands such that their product is maximal.