

MTH4100

Calculus 1, Autumn 2012

Exercise sheet 5

Prof. Bill Jackson

These questions are designed to help you understand the material covered in week n , $n \in \mathbb{N}$ lectures. Exercise sheets will typically be handed out in the Tuesday lecture of week $n + 1$. You will get help on them in your exercise class on Tuesday or Wednesday of the same week. You should write up your solution to the starred question (*) clearly and hand it in to your assigned helper during your week $n + 2$ exercise class for feedback. Put your *full name and student number* on the top of your solution. It is important that you try to do all of the questions, not just the starred question.

(*)1. [(a), (b) 2008 exam questions]

- (a) State the definition of the derivative of the function $f(x)$ with respect to the variable x .
- (b) Differentiate from first principles $f(x) = \sqrt{x}$ by using the definition involving $h \rightarrow 0$.
- (c) Does any tangent to the curve $y = \sqrt{x}$ cross the x -axis at $x = -1$? If so, find an equation for this tangent and determine the point where it meets the curve. If not, explain why not?

2. [2008 exam question]

Find equations of all lines having slope -2 that are tangent to the curve

$$y = \frac{18}{x+9}.$$

3. [(a),(b) 2008/09 exam questions]

- (a) Find the first and second derivatives of $y = \frac{4x^5 + 8}{x^3}$, $x \neq 0$.
- (b) Find the derivative $q'(t)$ of $q(t) = \tan \frac{t}{\sqrt{t+2}}$.
- (c) Find the derivative $g'(t)$ of $g(t) = \cos(2 - \sin 3t)$.