MTH 1020 Week 10 tutorial

- Work through a problem from last week
- 2 Teaching evaluations

3

< 1 k

∃ →

Week 9, Q6(b)

Question

Find all local maxima and minima of $f(t) = \sqrt{2-t} + t$.

- What is the domain of f? f is defined everywhere that √2-t is defined, which is the interval (-∞, 2]. So t = 2 is a critical point.
- Where is the derivative zero? Using the chain rule we find

$$f'(t) = -rac{1}{2\sqrt{2-t}} + 1.$$

So $f'(t) = 0 \iff 2\sqrt{2-t} = 1 \iff 2-t = 1/4 \iff t = 7/4$. So t = 7/4 is a critical point.

 Where is the derivative undefined? f'(t) is defined everywhere √2-t ≠ 0, which is everywhere except t = 2 (on the edge of the domain anyway).

Week 9, Q6(b)

Question

Find all local maxima and minima of $f(t) = \sqrt{2-t} + t$.

• We computed

$$f'(t) = -rac{1}{2\sqrt{2-t}} + 1$$

and found two critical points, t = 2 and t = 7/4.

• The second derivative is

$$f''(t) = -rac{1}{4(2-t)^{-3/2}}$$

- At t = 7/4, f''(t) = -2. So the function is concave down and t = 2 is a local max.
- f''(2) is undefined so we need a different argument. Note that f''(t) is defined in the entire open interval $(-\infty, 2)$ and f'(t) is negative when t > 7/4; in particular as $t \to 2$, the function f is decreasing, so t = 2 is a local minimum.

Alex Elzenaar

MTH 1020 Week 10 tutorial

Key concepts so far

- **1** Limit calculations. Definitions of continuity, differentiability.
 - Being able to compute simple limits is a 'pass' skill.
 - Know different interpretations of derivative: rate of change, tangent line slope.
 - Have a zoo of weird examples e.g. $x \sin(1/x)$, |x|,...
- Usual differentiation laws (chain and product laws, implicit differentiation) and derivatives of basic functions (xⁿ, sin x, cos x, exp x, log x, |x|).
 - ► Do enough examples that you don't need to think to compute *f* ' from a formula for *f*.
 - ▶ Being able to compute derivatives mechanically is a 'pass' skill.
- Intermediate value theorem: if $f : [a, b] → \mathbb{R}$ is a continuous function, f(a) < 0, and f(b) > 0, then there exists $c \in [a, b]$ such that f(c) = 0
- Extrema: definition of critical point, inflection point, concavity. Optimisation problems.

イロト 不得 トイヨト イヨト

Teaching evaluations

- I will hand out the evaluation sheets and then leave for 5 minutes to let you fill it in (feel free to talk amongst yourselves).
- Please keep the sheets anonymous. Do not write anything personally identifiable. Definitely do NOT put your name on the sheet.
- When I will come back I will get a volunteer to go around with an envelope for you to put your sheets into. Please fold them in half so that the writing is not visible.
- The sheets will go to Simon to read, I don't get them until the end of the semester when all the grades are finalised. Please bear this in mind, if there is something specific you want to see changed during the semester it is better to talk to me or Simon directly if you are comfortable doing that, otherwise the feedback will only help us next time we teach.

< □ > < □ > < □ > < □ > < □ > < □ >

MTH 1020 Week 10 tutorial

- Get into groups of 3-4 people who all prepared a different question in advance.
- Write your preferred name and ID number on the whiteboards so I can take attendance
- Present your prepared question to each other as I come around, you should only take about 5min each for this.
- Then get started on the other questions in your groups.
- At the end: please erase the boards and return any markers etc that you used (you do not need to return the handouts)