

## Grading and remarks for Lab 4

- 1 For part (a) I awarded 0.5 points for finding the right  $f$ , 0.5 point for finding the right  $g$ , 0.5 points for providing a reason for the continuity of  $g$  (saying it is a polynomial or at least mentioning it is everywhere continuous) and 0.5 points for the continuity of  $f$  at 2.25. As for the continuity of  $f$  at 2.25, I did not award credit for checking continuity at 1.5 instead.

For part (b) I awarded 0.5 for finding  $f$  and  $g$ , 0.5 for saying that the domain of  $g$  is all the real numbers, 0.5 for showing that the range of  $g$  is  $(0, 1]$ , 0.5 for stating that  $\tan(x)$  is continuous on  $(-\pi/2, \pi/2)$  and that the range of  $g$  falls in there.

For part (c) I awarded 0.5 for finding  $f$  and  $g$ , 0.5 for determining the domain of continuity of  $g$ , 0.5 for determining the domain of continuity of  $f$ , 0.5 for pointing out that the range of  $g$  is contained in the domain of continuity of  $f$ .

As general remark, when you check whether  $f(g(x))$  is continuous at  $a$ , as for  $f$  you have to look at what happens at  $g(a)$ , not at  $a$ . Also, beware that if you quote theorem 7 at page 118, it says that those functions are continuous in their domains. So it is wrong to state that trigonometric functions or logarithm are continuous everywhere. Finally, for continuity sake what matters is the domain of continuity, not the domain of the function. That's why I did not award credit in part (c) to people who spoke about domain and not domain of continuity (even though in this particular case they coincide).

- 2 For part (a) I gave 1 point per part of the graph (i.e. 1 point for getting it right for  $x \leq 0$  and 1 for  $x \geq 1$ ). I took away one point if the two branches of exponential functions did not terminate at 0 and 1 (the function is not defined between 0 and 1).

For part (b) I awarded 1 point for getting  $a$  right and 1 point for getting  $b$  right. In this particular case I accepted answers with no further work shown, since the answer could follow from a correct graph in part (a) (beware that in general I do not award credit for no work shown!)

For part (c) I awarded 1 point for stating that there is a cusp, or a corner or a kink, I awarded 1.5 points for saying that the two slopes are different, I awarded 2 points for exhibiting the two slopes.

For part (d) I gave 2 points to everybody because of the typo. Please notice that the typo has been pointed out on Canvas and in class. Nevertheless many people did not correct the exercise. As general remark, please make sure you check the information on Canvas and pay attention to information provided in class.

As general remark, notice that rephrasing a definition does not provide an explanation. For instance, if you want to prove that  $f$  is not differentiable at 0, saying that

$$\lim_{h \rightarrow 0} \frac{f(0+h) - f(0)}{h}$$

does not exist does not provide any answer, since it is just restating what you have to show.

3 For (a) I gave 1 point per correct function (algebraic expression or graph).

For (b) I gave 2 points for drawing or giving the algebraic expression of a suitable function, 0 otherwise.

For (c) I gave 1 point for using direct substitution without saying that it is allowed by the fact that  $hW(h)$  is a continuous function. I gave 2 points to those who tried to use the squeezing theorem but had some algebra mistakes. I awarded 3 points to those who used correctly either direct substitution for continuous functions or the squeezing theorem.

For (d) I decided not to be picky, so I awarded 2 points to everybody who recognized that there are two continuous functions involved. Nevertheless, please try to use the theorems (there are two functions which are continuous, hence their product is continuous too). Also, make sure you use the right language: here we had a product of two functions, not a composition!!!

For (e) I gave 1 point for a partial understanding of the problem (with imprecise or inappropriate wording in the explanation for instance) or for minor algebra mistakes, while I awarded 2 points for an answer in which there was understanding that the limit as  $x$  approaches 0 does not exist, how the two sequences suggested show.