

## MATH 251 (PHILLIPS): WRITTEN HOMEWORK 4.

This sheet is part of the homework for Week 4, and is due in class on **Wednesday** 30 January 2008.

All the requirements in the sheet on general instructions for homework apply. In particular, show your work (unlike WebAssign), give exact answers (not decimal approximations; again, unlike WebAssign), and use correct notation. Some of the grade will be based on correctness of notation in the work shown.

1. Differentiate the following functions:

a.  $g(x) = 2x^k - \frac{a}{x} - b\sqrt{x} + \frac{3}{7} - \pi^2$ , where  $a$ ,  $b$ , and  $k$  are constants.

b.  $h(x) = -xf(x)$ , where  $f$  is a function such that  $f'(x) = e^{-x^2} + \sqrt{3}$ . (Your answer might involve the function  $f$ .)

c.  $h(t) = t + \sqrt{2} - cg(t)$ , where  $g$  is a function such that  $g'(x) = e^{x^2} - e^x$  and  $c$  is a constant. (Your answer might involve the function  $g$ .)

2. In each part, either draw the graph of a function satisfying the given conditions, or explain why no such function exists.

a.  $f$  is differentiable at  $-1$  but not continuous at  $-1$ .

b.  $f$  is continuous at  $-1$  but not differentiable at  $-1$ .

c.  $f(1) < 0$  and  $f'(1) > 0$ .

d.  $f$  is not defined at 1, but  $\lim_{x \rightarrow 1} f(x)$  exists.