

**Problem statement** Values of a twice differentiable function,  $f$ , and its first and second derivatives are in the table to the right. Use this information to answer the following questions as well as you can.

$x$	$f(x)$	$f'(x)$	$f''(x)$
1	2	0	2
2	3	6	5
3	7	3	-4
4	2	5	7

- If  $g(x) = (f(x))^2$ , compute  $g(2)$ ,  $g'(2)$ , and  $g''(2)$ .
- If  $h(x) = f(x^2)$ , compute  $h(2)$ ,  $h'(2)$ , and  $h''(2)$ .
- If  $k(x) = f(f(x))$ , compute  $k(2)$ ,  $k'(2)$ , and  $k''(2)$ .
- If  $h$  is a small number, write an approximation (the linearization of  $f$  at 3) for  $f(3+h)$ .
- Is your answer in a) likely to be an underestimate of the true value of  $f(3+h)$  when  $h$  is small, or an overestimate? Give a reason for your answer.