

For this entire exam, let  $f(x) = 5x - 1$ ,  $g(x) = \sqrt{x}$ , and  $a \in \mathbb{R}$ . No notes, calculator!

1. Find  $f(6)$ ,  $g(a^2)$ ,  $(f \circ g)(0)$ ,  $(g \circ f)(1)$ , the domains of  $f$  and  $g$  and  $g \circ f$ , and the intersection points of  $f \cdot f$  and  $g \cdot g$ .
2. Show, using **the definition** of the limit, that  $\lim_{x \rightarrow 1} f(x) = 4$  and  $\lim_{x \rightarrow 1} g(x) = 1$ .
3. Show, using the Intermediate Value Theorem, that  $f$  and  $g$  have an intersection point in the interval  $(0, 1)$ . Use the bisection method to determine an interval of length 0.125 in which this point lies.
4. Calculate  $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$  and  $\lim_{t \rightarrow 4} \frac{g(t) - g(4)}{t - 4}$ .