1. Show that the following functions are uniformly continuous on the given domain or prove that they are not:

(a) \( f(x) = x^2 \) with domain \([0, 1]\).

(b) \( g(x) = \frac{1}{x} \) with domain \((0, 1]\).
2. Let $f: (-1,1) \to \mathbb{R}$ be a continuous (but not necessarily differentiable) function with $f(0) = 1$ and let $g(x) = xf(x)$. Show that $g'(0) = 1$. (In particular show that $g'(0)$ exists.)
3. Let $f(x) = \sqrt{x+1}$ and show that $f'(x) \leq \frac{1}{2}$ if $x \geq 0$. Use this and the Mean Value Theorem to show that $\sqrt{x+1} \leq 1 + \frac{x}{2}$ if $x \geq 0$. 
4. Let $f(x) = 1/x$ with domain $[1, 2]$.

(a) Let $P = \{1 < 3/2 < 2\}$ be a partition and calculate the upper and lower sums $U(f, P)$ and $L(f, P)$.

(b) Use the previous problem to give upper and lower bounds for the integral

$$\int_1^2 f(x) \, dx.$$
Scratchwork