

**Exercise 1** Let  $g(x) = -x^2$  and  $h(x) = 2|x - 1| - 1$ .

(a) Calculate the following limits.

(i)  $\lim_{x \rightarrow 1} g(x) = \boxed{-1}$

(ii)  $\lim_{x \rightarrow 1} h(x) = \boxed{-1}$

(iii)  $\lim_{x \rightarrow 1} \frac{g(x)}{h(x)} = \boxed{1}$

(iv)  $\lim_{x \rightarrow 1} \frac{h(x) - h(4)}{x - 4} = \boxed{2}$

(b) Find the expression for  $h(x)$ , if  $x < 1$ .

$$h(x) = \boxed{-2}x + \boxed{1}, \text{ if } x < 1.$$

(c) Find the expression for  $h(x)$ , if  $x \geq 1$ .

$$h(x) = \boxed{2}x - 3, \text{ if } x \geq 1.$$

(d) Make the correct choice.

The given inequality,  $g(x) \leq h(x)$ , is (true ✓/ not true) for all values of  $x$ .

(e) Let  $f$  be a function such that  $g(x) \leq f(x) \leq h(x)$  for all  $0 < x < 2$ .

Then  $\lim_{x \rightarrow 1} f(x) = \boxed{-1}$ , by (limit laws/ continuity/ difference law/ quotient law/ the Squeeze Theorem ✓).

---