Calculus I

# Quiz 3

Name: ME

Explain your solution process clearly.
Write legible.

1. (6 points) Let

$$f(x) = \begin{cases} \sqrt{-x} & x < 0 \\ 3 - x & 0 \le x < 3 \\ (x-3)^2 & x > 3 \end{cases}.$$

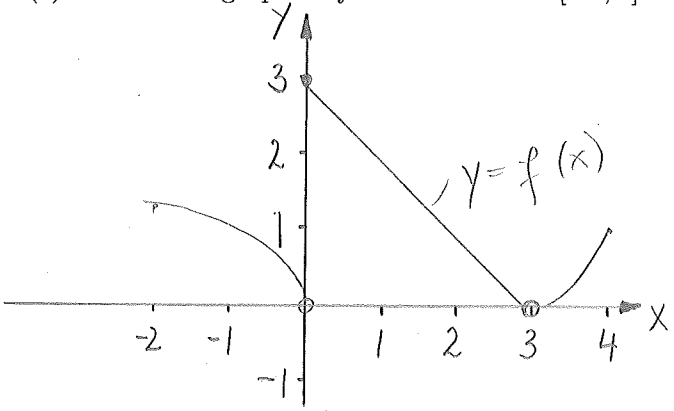
(a) Evaluate each limit, if it exists (no justification for your answers are necessary for this part).

(i) $\lim_{x\to 0+} f(x) =$ 3 (ii) $\lim_{x\to 0-} f(x) =$ 0 (iii) $\lim_{x\to 0} f(x) =$ DNE

(iv) $\lim_{x\to 3-} f(x) =$ 0 (v) $\lim_{x\to 3+} f(x) =$ 0 (vi) $\lim_{x\to 3} f(x) =$ 0

(b) Where is $f$ discontinuous? When $x \neq 0$ and $x \neq 3$, then $f(x)$ is continuous because $\sqrt{-x}$, $3-x$, $(x-3)^2$ are continuous on their domains. $f$ is disc. at $x=0$ because of (iii)
$f$ is disc. at $x=3$ because $f$ is not defined at $x=3$

(c) Sketch the graph of $f$ on the interval $[-2, 4]$.




2. (2 points) True or false: If $f$ is a continuous function, then $|f|$ is a continuous function.

True, because: if $f$ is continuous, then $f^2$ is continuous, and then $\sqrt{f^2}$ is continuous, but $\sqrt{f^2} = |f|$.

3. (2 points) True or false: If $|f|$ is a continuous function, then $f$ is a continuous function.

False, for instance if $f(x) = \begin{cases} -1 & x \le 0 \\ 1 & x > 0 \end{cases}$,

then $f$ is not continuous at 0, but $|f(x)| = 1$ for all $x$ and so $|f|$ is continuous.