Answer on Question #66925 – Math – Calculus

Question

Check the continuity of

{x+1, x is less than 1}

f(x) = {0, x is greater than 1 and x is less than 2}

{2-x , x is greater than 2}

Solution

$$f(x)=\begin{cases}x+1, & x<1;\\ 0, & 1<x<2\ ;\\ 2-x, & x>2;\end{cases}$$

$$f(1-0)=\lim_{x\to 1^-} f(x)=2,$$
$$f(1+0)=\lim_{x\to 1^+} f(x)=0,$$
$$f(2-0)=\lim_{x\to 2^-} f(x)=0,$$
$$f(2+0)=\lim_{x\to 2^+} f(x)=0.$$

A value of $f(1)$ is not defined.

There exist finite one-sided limits $f(1-0)$ and $f(1+0)$, but the relations

$$\lim_{x\to 1-0} f(x)=\lim_{x\to 1+0} f(x)=f(1)$$

do not hold, then 1 is a point of discontinuity of the first kind for a function $f(x)$.

A value of $f(2)$ is not defined.

If

$$f(2+0)=f(2-0)\neq f(2),$$

then 2 is a point of removable discontinuity.

Thus, the function $f(x)$ is not continuous.