ASSIGNMENT 4

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AI20BTECH11011

Download all python codes from

https://github.com/Dishank422/EE3900/blob/main/assignment4/codes

and latex-tikz codes from

https://github.com/Dishank422/EE3900/blob/main/assignment4/Assignment4.tex

1 Linear forms Q 2.56

Examine the following functions for continuity

(a) $f(x) = x - 5$

(b) $f(x) = |x - 1|$

2 Solution

(a) for any arbitrary c,

$$\lim_{x \to c^+} f(x) = c - 5 \tag{2.0.1}$$

$$\lim_{x \to c^-} f(x) = c - 5 \tag{2.0.2}$$

$$f(c) = c - 5 \tag{2.0.3}$$

$$\implies \lim_{x \to c^+} f(x) = \lim_{x \to c^+} f(x) = f(c) \ \forall c \tag{2.0.4}$$

Therefore f(x) is continuous for all x$\in \mathcal{R}$. The same can be observed from figure (a).

(b) for any c < 1,

$$\lim_{x \to c^+} f(x) = 1 - c \tag{2.0.5}$$

$$\lim_{x \to c^-} f(x) = 1 - c \tag{2.0.6}$$

$$f(c) = 1 - c \tag{2.0.7}$$

$$\implies \lim_{x \to c^+} f(x) = \lim_{x \to c^+} f(x) = f(c) \ \forall c < 1 \tag{2.0.8}$$

for any c > 1,

$$\lim_{x \to c^+} f(x) = c - 1 \tag{2.0.9}$$

$$\lim_{x \to c^-} f(x) = c - 1 \tag{2.0.10}$$

$$f(c) = c - 1 \tag{2.0.11}$$

$$\implies \lim_{x \to c^+} f(x) = \lim_{x \to c^+} f(x) = f(c) \ \forall c > 1 \tag{2.0.12}$$

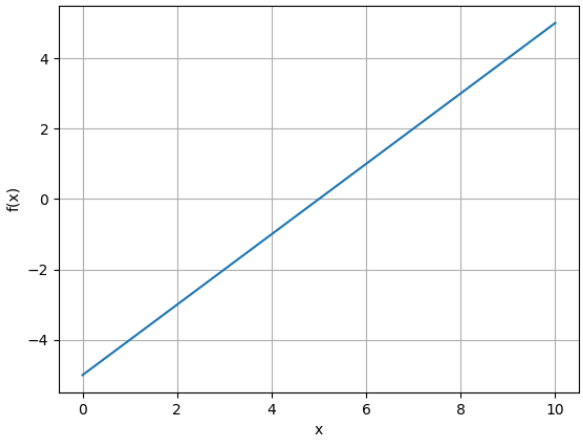

Fig. (a): plot for f(x) = x-5

for c = 1,

$$\lim_{x \to c^+} f(x) = 0 \tag{2.0.13}$$

$$\lim_{x \to c^-} f(x) = 0 \tag{2.0.14}$$

$$f(c) = 0 \tag{2.0.15}$$

$$\implies \lim_{x \to c^+} f(x) = \lim_{x \to c^+} f(x) = f(c) \ for \ c = 1 \tag{2.0.16}$$

Therefore f(x) is continuous for all x$\in \mathcal{R}$. The same can be observed from figure (b).

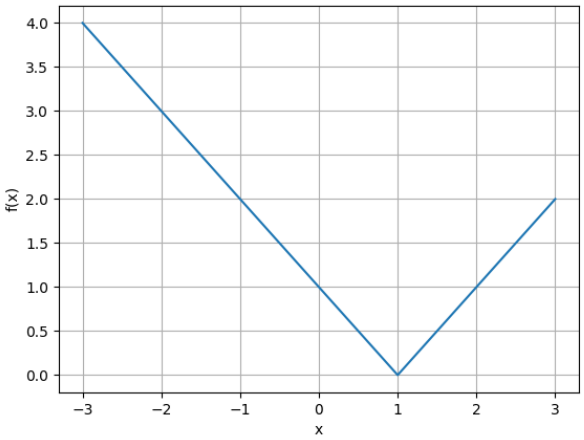

Fig. (b): plot for f(x) = x-5