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18/ENG01/016.
CHEMICAL ENGINEERING.

a) show that the limit of the function given in equation (1.1) as x approaches 0 is a/b.

$$F(x) = \frac{\sin ax}{bx}$$

Solution

$$F(x) = \frac{\sin ax}{bx}$$

$x \longrightarrow 0$

$$f(x) = \frac{\sin a(0)}{b(0)} = \frac{0}{0} = \text{Indeterminable.}$$

$\therefore$ By applying L'hopital's Rule,

$$\lim_{x \to 0} \frac{a \cos ax}{b}$$

$x \to 0$,

$$\frac{a \cos a.0}{b} = \frac{a \cos 0}{b}$$

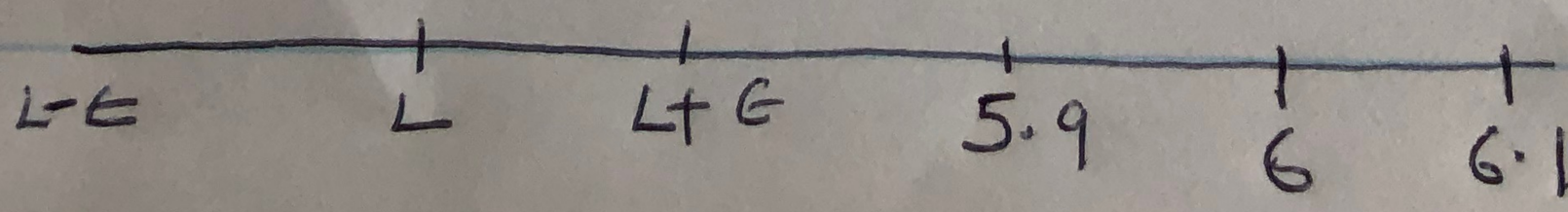
$$= \frac{a.1}{b}$$

$$\therefore F(x) = \frac{\sin ax}{bx} = \frac{a}{b} //$$

$$\lim_{x \to 0}$$

b) The model of a system has been developed to be as given in equation (1.2) $F(x) = 5x - 21$

Given that $\delta = 0.1$ and $\Delta\delta = 0.01$ demosbrate, in tabular form, that the limit of the model as $x \to 6$ is equal to 9.



$L-\varepsilon$	$a-\delta$	a	$a+\delta$	$L+\varepsilon$
8·50	5·9	6	6·10	9·50
8·55	5·91		6·09	9·45
8·60	5·92		6·08	9·40
8·65	5·93		6·07	9·35
8·70	5·94		6·06	9·30
8·75	5·95		6·05	9·25
8·80	5·96		6·04	9·20
8·85	5·97		6·03	9·15
8·90	5·98		6·02	9·10
8·95	5·99		6·01	9·05
9·00	6·00		6·00	9·00

c Show whether the function given in equation (1·3) is continuous on the interval $(-5, 5)$.

$$F(x) = (25 - x^2)^{1/2}$$

Solution

$$F(x) = (25 - x^2)^{1/2}$$

$\therefore \lim x \to 5$

$$= \left((25 - (5)^2\right)^{1/2}$$

$$= \sqrt{25 - (5)^2}$$

$$= \sqrt{25 - 25}$$

$$= \sqrt{0} = 0.$$

$\therefore \lim x \to 5$

$$= (25 - (5)^2)^{1/2}$$

$$= \sqrt{25 - 25}$$

$$= \sqrt{0} = 0$$

$\therefore$ The function is continous.