

NAME: UGBEATLE VALENTINA CATINDASSO

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DEPARTMENT: Biomedical Engineering

COURSE: ENGINEERING MATHEMATICS 1

COURSE CODE: ENG 281

ASSIGNMENT

Show that the limit of the function given in equation (1.1) as x approaches 0 is $a/b \cdot f(x) = \frac{\sin ax}{bx}$

Solution

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

$$f(x) = \frac{\sin a(0)}{b(0)} \Rightarrow \text{Indeterminate}$$

Applying l'Hopital's rule

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

$$f(x) = \frac{a \cos ax}{b}$$

$$\lim_{x \rightarrow 0} f(x) = \frac{a \cos 0}{b} = \frac{a \times 1}{b} = \frac{a}{b}$$

The model of a system has been developed to be given by equation (1.2) $f(x) = 5x - 21$. Given that $\delta = 0.1$ and $\delta = 0.01$, demonstrate, in a tabular form, that the limit of the model as $x \rightarrow 6 \pm \delta$

Solution

$$f(x) = 5x - 21 \quad \delta = 0.1, \Delta \delta = 0.01$$

$$x \rightarrow 6$$

$$n, \text{ for } x = (6 - \delta, 6 + \delta)$$

$$\text{for } f(x) = (9 - \delta, 9 + \delta)$$

x	$f(x)$	x	$f(x)$
5.90	8.50	6.10	9.50
5.91	8.55	6.09	9.45
5.92	8.60	6.08	9.40
5.93	8.65	6.07	9.35
5.94	8.70	6.06	9.30
5.95	8.75	6.05	9.25
5.96	8.80	6.04	9.20
5.97	8.85	6.03	9.15
5.98	8.90	6.02	9.10
5.99	8.95	6.01	9.05
6.00	9.00	6.00	9.00

① Show whether the function given in equation (1.3) is continuous on the interval $(-5, 5)$. $f(x) = (25 - x^2)^{1/2}$

Solution

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

$\Rightarrow (-5, 5) \Rightarrow$ interval.

when it is -5

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

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

$$f(x) = (0)^{1/2}$$

$$f(x) = 0$$

when $x = -4$

$$f(x) = (25 - (-4)^2)^{1/2}$$

$$f(x) = (25 - 16)^{1/2}$$

$$f(x) = (9)^{1/2}$$

$$f(x) = 3$$

when $x = -3$

$$f(x) = (25 - (-3)^2)^{1/2}$$

$$f(x) = (25 - 9)^{1/2}$$

$$f(x) = (16)^{1/2}$$

$$f(x) = 4$$

when $x = -2$

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

$$f(x) = (25 - 4)^{1/2}$$

$$f(x) = (21)^{1/2}$$

$$f(x) = 4.583$$

when $x = -1$

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

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

$$f(x) = (24)^{1/2}$$

$$f(x) = 4.899$$

when $x = 0$

$$f(x) = (25 - (0)^2)^{1/2}$$

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

$$f(x) = 5$$

when $x = 1$

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

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

$$f(x) = 24^{1/2}$$

$$= 4.899$$

when $x = 2$

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

$$f(x) = (25 - 4)^{1/2}$$

$$f(x) = (21)^{1/2}$$

$$f(x) = 4.583$$

when $x = 3$

$$f(x) = (25 - (3)^2)^{1/2}$$

$$f(x) = (25 - 9)^{1/2}$$

$$f(x) = (16)^{1/2}$$

$$f(x) = 4$$

when $x = 4$

$$f(x) = (25 - (4)^2)^{1/2}$$

$$f(x) = (25 - 16)^{1/2}$$

$$f(x) = (9)^{1/2}$$

$$f(x) = 3$$

when $x = 5$

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

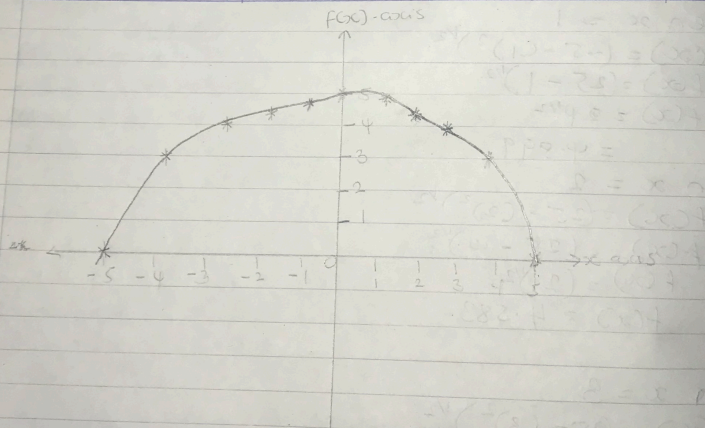
$$= (25 - 25)^{1/2}$$

$$= (0)^{1/2}$$

$$= 0$$

The table

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
$f(x)$	0	3	4	4.583	4.899	5	4.899	4.583	4	3	0



The function $f(x) = (25 - x^2)^{1/2}$ is continuous on the interval $(-5, 5)$.