

NAME: AKA PEACE OTAOGHENE
MATRIC NUMBER: 18/ENG 01/002
DEPARTMENT: CHEMICAL ENGINEERING

1a Show that the Limit of the function given in equation (1.1) as x approaches 0 is $\frac{a}{b}$

$$f(x) = \frac{\sin ax}{bx} \quad (1.1)$$

Sol

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

$$x \rightarrow 0 = \frac{\sin ax}{bx}$$

$$= \frac{0}{0} \text{ Indeterminate}$$

Using L'hopital Rule

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

$$x \rightarrow 0$$

$$= \frac{a \cos ax}{b}$$

$$= \frac{a \cos ax}{b} = \frac{a}{b}$$

b The model of a system has been developed to be given in Equation (1.2)

$$f(x) = 5x - 21$$

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

Sol

$$a-\delta \quad a \quad a+\delta$$

$$f(x) = 5x - 21$$

$$5.9 \quad 6 \quad 6.1$$

L-E	$a-\delta$	a	$a+\delta$	L+E
8.5	5.91	6	6.1	9.5
8.55	5.91		6.09	9.45
8.6	5.92		6.08	9.4
8.65	5.93		6.07	9.35
8.7	5.94		6.06	9.3
8.75	5.95		6.05	9.25
8.8	5.96		6.04	9.2
8.85	5.97		6.03	9.15
8.9	5.98		6.02	9.1
8.95	5.99		6.01	9.05
9	6		6	9

c Show whether the function given in Equation (1.3) is continuous on the interval $(-5, 5)$

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

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

when $x = -5$

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

$$f(x) = 0$$

when $x = -4$

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

$$= 3$$

when $x = -3$

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

$$f(x) = 4$$

when $x = -2$

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

$$= 4.58$$

When $x = -1$

$$f(x) = (25 - (-1)^2)^{1/2}$$
$$= 4.89$$

When $x = 0$

$$f(x) = (25 - (0)^2)^{1/2}$$
$$= 5$$

When $x = 1$

$$f(x) = (25 - (1)^2)^{1/2}$$
$$= 4.89$$

When $x = 2$

$$f(x) = (25 - (2)^2)^{1/2}$$
$$= 4.58$$

When $x = 3$

$$f(x) = (25 - (3)^2)^{1/2}$$
$$= 4$$

When $x = 4$

$$f(x) = (25 - (4)^2)^{1/2}$$
$$= 3$$

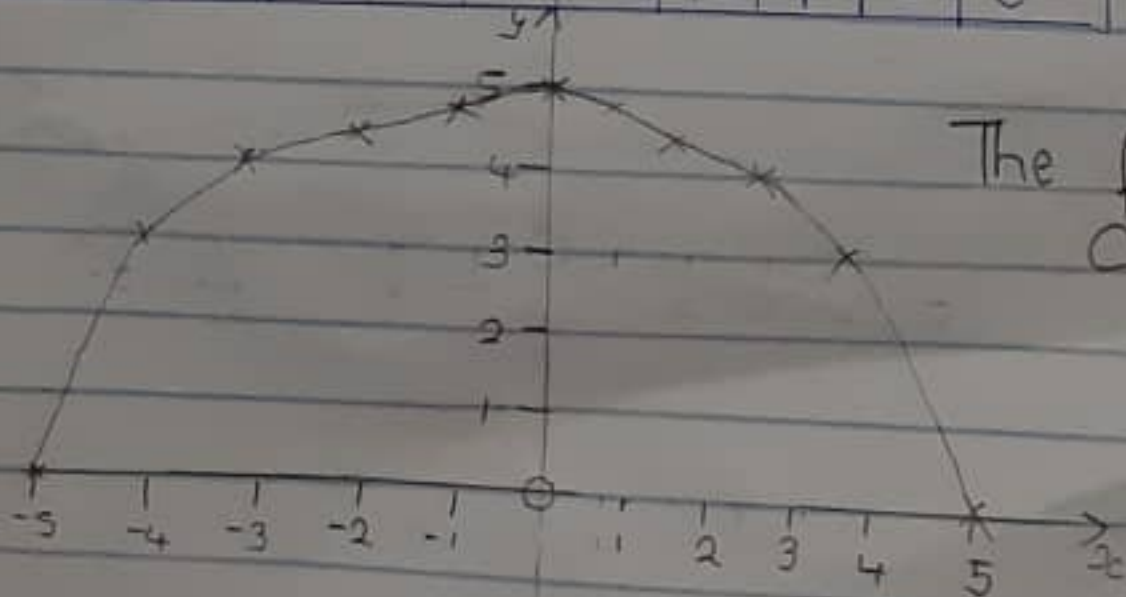
When $x = 5$

$$f(x) = (25 - (5)^2)^{1/2}$$
$$= 0$$

∴ the function on the interval $(-5, 5)$ is continuous

Graphically

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y	0	3	4	4.58	4.89	5	4.89	4.58	4	3	0



The function is
continuous