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18/ENG08/025
BIOMEDICAL ENGINEERING
ENG 281
ASSIGNMENT

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

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

Soln

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

$$= \frac{\sin a(0)}{b(0)} = \frac{0}{0} \{\text{undefined}\}$$

Using l'hopital's rule

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

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

$$\lim_{x \to 0} f(x) = \frac{a \cos a(0)}{b} = \frac{a}{b}$$

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 $\Delta\delta = 0.07$, demonstrate in a tabular form, that the limit of the model as $x \to 6$ is equal to 9

Soln

$\delta = 0.1$, $\Delta\delta = 0.01$, $\varepsilon = 0.05$

$6 - 0.1 = 5.9$ [left hand side]
$6 + 0.1 = 6.1$ [right hand side]
$9 - 0.5 = 8.5$ (LHS)
$9 + 0.5 = 9.5$ (RHS)

x	$F(x)$
5.9	8.5
5.91	8.55
5.92	8.60
5.93	8.65
5.94	8.70
5.95	8.75
5.96	8.80
5.97	8.85
5.98	8.90
5.99	8.95
6.00	9.00

x	$F(x)$
6.1	9.5
6.09	9.45
6.08	9.40
6.07	9.35
6.06	9.30
6.05	9.25
6.04	9.20
6.03	9.15
6.02	9.10
6.01	9.05
6.00	9.00

C. Show whether the function given in equation (1.3) is continuous on the interval [-5, 5]

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

Soln

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

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

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

$x \to -2$

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

$= 4.58$

$x \to -1$

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

$= 4.89$

$x \to 0$

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

$= 5$

$x \to 1$

$f(x) = [25 - (1)^2]^{\frac{1}{2}}$

$= 4.89$

$x \to 2$

$f(x) = [25 - (2)^2]^{\frac{1}{2}}$

$= 4.58$

$x \to 3$

$f(x) = [25 - (3)^2]^{\frac{1}{2}}$

$= 4$

$x \to 4$

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

$= 3$

$x \to 5$

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

$= 0$

The function on the interval $[-5, 5)$ is continuous