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ENG 281 (ENGINEERING MATHEMATICS)

(1) $\lim_{x \to 0} \frac{\sin ax}{bx}$

$= \lim_{x \to 0} \sin ax \times \frac{1}{bx}$

$= \frac{\sin ax}{ax} \times \frac{a}{b}$

$= \frac{a}{b} \times \lim_{x \to 0} \frac{\sin ax}{ax}$

Using $\lim_{x \to 0} \frac{\sin ax}{ax} = 1$

$x = ax$

$= a/b \times 1 = a/b$

$\therefore \lim_{x \to 0} \frac{\sin ax}{bx} = a/b$

(2a)

(8) Show whether the function in equation (1,3) is continuous on the interval $(-5,5)$

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

Solution:

$f(x) = (25 - x^2)^{1/2} \quad (-5, 5) = Fx = \sqrt{25 - x^2}$

$f(x) = \sqrt{25 - (-5)^2} = 0$

$F(x) = F(-4) = \sqrt{25 - (-4)^2} = 3$

$F(x) = F(-3) = \sqrt{25 - (-3)^2} = 4$

$F(x) = F(-2) = \sqrt{25 - (-2)^2} = 4.58$

$F(x) = F(-1) = \sqrt{25 - (-1)^2} = 4.899$

$F(x) = F(0) = \sqrt{25 - (0)^2} = 5$

$F(x) = F(1) = \sqrt{25 - (1)^2} = 4.899$

$F(x) = F(2) = \sqrt{25 - (2)^2} = 4.58$

$F(x) = F(3) = \sqrt{25 - (3)^2} = 4$

$F(x) = F(4) = \sqrt{25 - (4)^2} = 3$

$F(x) = F(5) = \sqrt{25 - (5)^2} = 0$

It is continuous at the interval $(-5, 5)$.

(2) $F(x) = 5x - 21$ as $x \longrightarrow 6$ limit $= a$

$\delta = 0.1$ $\Delta\delta = 0.01$

L−δ	a−δ	a	a+δ
8.50	5.90	6.00	6.10
8.55	5.91	6.00	6.09
8.60	5.92	6.00	6.08
8.65	5.93	6.00	6.07
8.70	5.94	6.00	6.06
8.75	5.95	6.00	6.05
8.80	5.96	6.00	6.04
8.85	5.97	6.00	6.03
8.90	5.98	6.00	6.02
8.95	5.99	6.00	6.01
9.00	6.00	6.00	6.00

L+ε (work)

$F(x) = 5(x) - 21 = 5(6.10) - 21 = 9.50$

$Fx = 5(x) - 21 = 5(6.09) - 21 = 9.45$

$Fx = 5(x) - 21 = 5(6.08) - 21 = 9.40$

$Fx = 5(x) - 21 = 5(6.07) - 21 = 9.35$

$Fx = 5(x) - 21 = 5(6.06) - 21 = 9.30$

$Fx = 5(x) - 21 = 5(6.05) - 21 = 9.25$

$Fx = 5(x) - 21 = 5(6.04) - 21 = 9.20$

$Fx = 5(x) - 21 = 5(6.03) - 21 = 9.15$

$Fx = 5(x) - 21 = 5(6.02) - 21 = 9.10$

$Fx = 5(x) - 21 = 5(6.01) - 21 = 9.05$

$Fx = 5(x) - 21 = 5(6.00) - 21 = 9.00$

Workings of L−ε

$F(x) = 5x - 21 = 5(5.90) - 21 = 8.50$

$F(x) = 5x - 21 = 5(5.91) - 21 = 8.55$

$F(x) = 5x - 21 = 5(5.92) - 21 = 8.60$

$F(x) = 5x - 21 = 5(5.93) - 21 = 8.65$

$F(x) = 5x - 21 = 5(5.94) - 21 = 8.70$

$F(x) = 5x - 21 = 5(5.95) - 21 = 8.75$

$F(x) = 5x - 21 = 5(5.96) - 21 = 8.80$

$F(x) = 5x - 21 = 5(5.97) - 21 = 8.85$

$F(x) = 5x - 21 = 5(5.98) - 21 = 8.90$

$F(x) = 5x - 21 = 5(5.99) - 21 = 8.95$

$F(x) = 5x - 21 = 5(6.00) - 21 = 9.00$